ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

A correspondent writes to the ELECTRICAL REVIEW as follows: "A thoughtful genius has invented an adding machine—so much less gray cranial matter disturbed. His successor as a world benefitor must produce a thought apparatus that, given certain necessary premises, will produce exact and mathematical conclusions; a *multum in parvo* influencing to the very depths the oncoming generations, inasmuch as hard, strenuous thought would be a thing of the past. The high-bred, nervous, wire-strung race specimens, having no reason for being, would in the survival of the fittest give place to the corn-fed, healthy, prosaic and eminently animal type, to whom a thought machine would be as the voice of the Lord crying in the wilderness—a sacred fetich. Strange that in these days of hebetudinous cranks and variegated religions, no one has arisen to proclaim his ability, in this one respect, to fill what publishers of new journals call 'a long-felt want.'"

The electric cabs in New York city did a record business during the blizzard, and proved their entire efficiency.

A London contemporary says that the Municipal Council of Shanghai, China, invites tenders for a concession for a period of 30 years for the exclusive right of establishing and working a telephone system in Shanghai. Particulars may be obtained on application to Messrs. John Pook & Company, 8 Jeffrey's square, St. Mary Axe, London, E. C.

The Queen of Spain, acting on behalf of King Alphonso, has conferred on Mr. Charles Gerhardi, M. I. E. E., manager of the Direct Spanish Telegraph Company, the honor of Commander of the Order of Isabel la Catolica. Mr. Gerhardi has been connected with telegraphy for nearly 50 years, and was present on board the United States steam frigate "Niagara" when the first attempt was made to lay an Atlantic cable in 1857, as well as at the final laying of that cable in 1858.

The establishment of a large electrical power plant, to be run by gas engines and to utilize the surplus gases from the by-product coke ovens, at Dunbar, Pa., has been proposed, and there is no reason, says the *Engineering and Mining Journal*, why it could not profitably be done in a district where there is a demand for power. The suggestion is worth serious consideration from coke-makers elsewhere. Power, considered as a by-product of the coke-oven, may in many cases be an important and profitable one.

A press dispatch from Toronto states that a startling offer for the supply of electric power to Toronto was among the tenders received by the Board of Control recently. The company, of which Dr. Pyne, M.L.A., and Mr. Ransom, of the Toronto Furnace Company, are prominent members, has put in a tender to light the city streets and supply energy for manufacturing purposes at the rate of one cent per horse-power per hour. Their capital, they state, will be $5,000,000, and when their dividends reach 10 per cent they offer to light the streets at cost price. They will also establish a manufactory for electric supplies, and the profits of this will come under the same agreement.

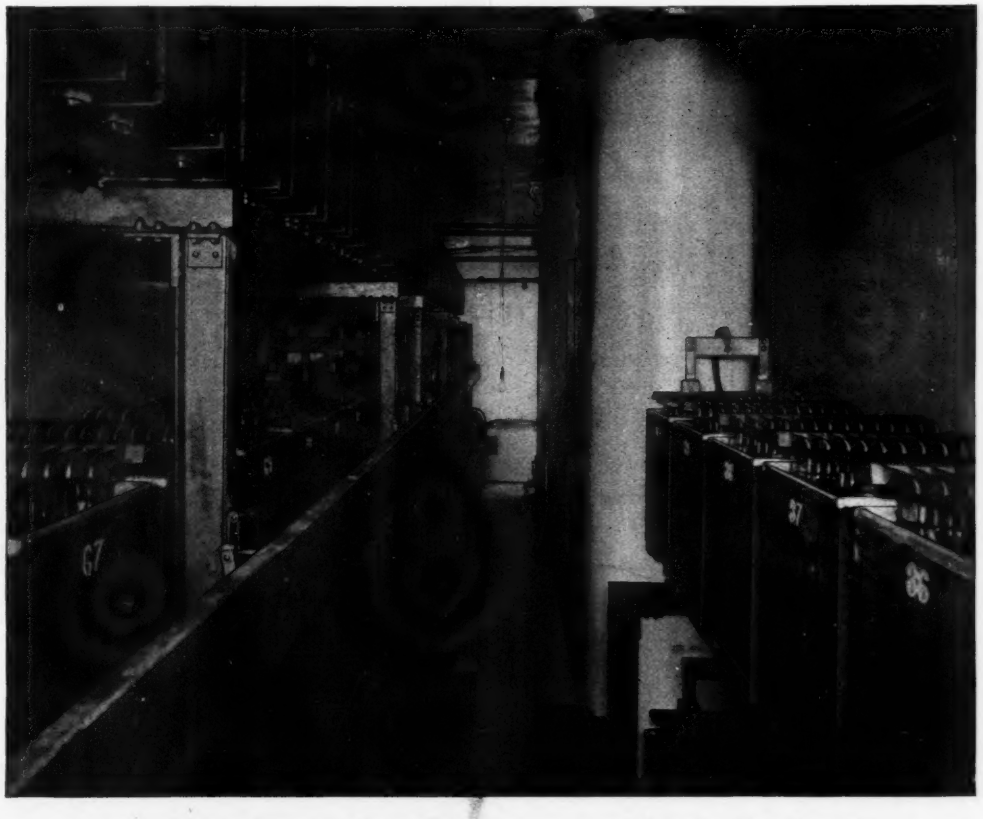

FIG. 1.—STORAGE BATTERY PLANT IN THE COMMERCIAL CABLE BUILDING, NEW YORK CITY.

The Storage Battery Plant in the Commercial Cable Building, New York City.

An unusually good example of the modern isolated electric plant is that installed for supplying the lighting and elevator service in the Commercial Cable Building, in New York city. This magnificently equipped building, 19 stories high, is located in the heart of the downtown district in New York, covering the properties at Nos. 20 and 22 Broad street. The building is wired for about 3,500 16-candle-power, 240-volt lamps, and is equipped with six screw-type Sprague elevators, power for the operation of this combined load being furnished by a modern 240-volt electric plant, with battery auxiliary consisting of the following apparatus: Two 300-horse-power, triple-drum water-tube boilers; two 225-horse-power, moderate-speed, single-cylinder engines, direct-connected to two six-pole, compound-wound, 150-kilowatt generators, running at 220 revolutions per minute; one 25 horse-power, specially-wound, motor-driven booster.

Unless the battery auxiliary had been installed, a third generating unit would have been required; but, under the present conditions, one generator runs from 9 A. M. to 9 P. M., and for the other 12 hours the battery carries the entire load, furnishing on an average 1,100 ampere hours at 240 volts.

The storage battery consists of 120 cells of "Chloride Accumulators," manufactured and installed by the Electric Storage Battery Company, of Philadelphia, each cell containing 27 plates, type G, 15½ by 15½, the containing tanks being 20½ by 27¾

by 20¾, lined with four-pound sheet lead. The plant, as originally installed about a year ago, provided for an increase of 100 per cent, and this increase has just been made, so that the tanks are now filled up. The capacity of each cell is as follows:

Rate in Amperes.	Capacity in Ampere Hours.
260	1,620
360	1,440
520	1,040
650	650

The tanks are mounted, as shown in Fig. 1, on a lead-coated iron battery rack, arranged for convenience in three tiers on one side of the room and in two tiers on the other side, strong running boards being bracketed out for the use of attendants, and affording easy access to each cell for inspection.

The battery is run in parallel with the generators, from 9 A. M. to 9 P. M., discharging for the sudden demands of the elevator service, and thus assisting in taking the load, while when the load drops off the battery immediately charges.

The curves shown in Fig. 3 were taken between the hours of 12.15 and 1.15 P. M. on October 10, 1898. In this figure the lower curve shows the work of the battery, its rapid fluctuation from charge to discharge, and represents the amount of work that a battery is called upon to perform in an installation of this character. The upper curve shows the actual pressure on the lighting bus exemplifying the benefit of the work which the battery performs, and showing how the voltage can be steadied when the generators are relieved of the fluctuating load. The center curve shows the slight variation in the current on the generators, which, as may be seen by the voltage curve, is not sufficient to effect any variation in the bus pressure.

Before the installation of the battery the two units were in constant service, and the installation of a third unit was contemplated; while now only one unit is in regular service with the battery, the second one being held as a reserve. During the day run the battery helps out by regulating discharges, from one to 150 kilowatts being required by the six elevators, while at night the generator is shut down, and the battery carries the entire load, the potential being kept up by cutting in reserve cells, which are wired up to a reserve-cell switch, and used for this special purpose.

The booster (Fig. 2) is a specially wound, motor-driven machine, the motor end wound for the 240-volt circuit, the dynamo end being specially designed, in its windings, to operate at practically a constant current. Thus, all the energy supplied to the battery is at a practically uniform rate, and the generators are only called upon to furnish the energy required to keep the battery charged for its regulating work at what is a practically uniform rate, and are thus relieved of the strain incident to the demands of the elevator service.

The switchboard is of slate, and fitted with all the necessary appliances for the operation of circuits and generators, the battery being operated with its booster by a special battery panel, shown at the left of the main board.

By this combined installation the service is completely protected against accidents, it being almost an absolute impossibility that a complete stoppage of both elevator and lighting circuit should occur, the battery being at all times connected to the circuit, and providing a reservoir of energy for protection in case of a breakdown in the generating plant. The battery also effects a considerable saving in the fuel and labor accounts.

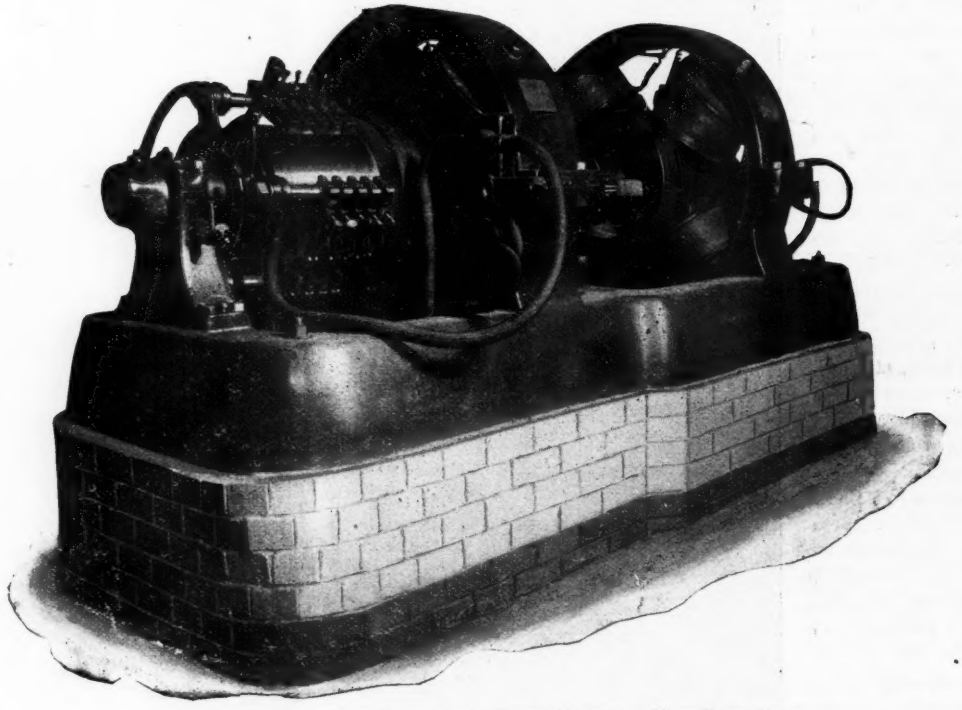

FIG. 2.—BOOSTER IN THE COMMERCIAL CABLE BUILDING, NEW YORK CITY.

It is reported that a company is being formed in Lexington, Ky., to build an electric railway between Lexington and Richmond, Ky., a distance of 22 miles. The principal promoters are F. J. Loughridge, vice-president of the Electric Street Railway Company, and Dr. Bennett, president of the National Exchange Bank. The road will cost $125,000. It will cross the Kentucky River at Clay's Ferry.

The Difference Between Candle-Power and Illuminating Power.

In the ELECTRICAL REVIEW for February 16, 1898, appeared an article by Mr. L. B. Marks, M. M. E., entitled "Candle-Power of a 10-Ampere 45-Volt Arc Lamp." Toward the close of the article, the author said that "the term candle-power, as applied to arc lamps, is well nigh meaningless." In a recent discussion of the enclosed alternating arc, before the American Institute of Electrical Engineers, Mr. Marks took the same view, and, to a question put by Captain Millis, of the United States Lighthouse Board, made a reply which, it is believed, is the first simple explanation that has been given of the difference between candle-power and illuminating power. Captain Millis's question and Mr. Marks's answer are quoted below from the Transactions of the Institute:

Captain Millis: Mr. President, I am somewhat disappointed at being discovered, since I would have preferred to be only an interested listener in an obscure corner. There is very little that I can add to what has already been said on this subject, but possibly I may submit one or two remarks presently. I should like very much to ask the gentleman who first addressed us to give us a somewhat more explicit idea as to what he means when he says that one light may have a greater candle-power than another, but a less luminous intensity. I do not understand exactly what he means, and I should be very glad if he could make this a little clearer.

Mr. Marks: I think that possibly in a few words I may be able to give my view of the matter. The candle-power of an arc, as I understand it, simply represents its power as compared with a standard source of light known as the candle. For instance, we have an ordinary standard candle. It burns 120 grains in an hour, or given standard time. We compare an incandescent lamp with that candle, and, by the aid of the photometer, obtain a ratio representing the illuminating power of the incandescent lamp in terms of the candle. From that we get the power of the arc lamp. Supposing the power of the arc lamp thus photometrically measured is 400; this would indicate that it has 400 times the illuminating power of the candle which was used as the source of the comparison. Now, let us take the arc light and put it in a reading-room, and read by it. Then let us take it and put it in the fields, and distinguish the color of the trees and natural objects by it. I ask you, will the true illuminating power of that arc lamp be 400 in both cases? I also ask you, will the illuminating power of an arc lamp not depend upon the use to which the light is put? Will it not depend upon its power of bringing out the true colors of objects, as well as of aiding the eye in seeing and distinguishing objects? I say that the illuminating power of a lamp depends largely upon the quality of the light. And the quality will depend upon the proportion of rays of short wave-length and of long wave-length in the light. In some cases, as in bringing out the colors of natural objects, and so on, the proportion of shorter wave-lengths in the light is all-important; while as far as the power of illumination, as applied simply to black and white is concerned, the

importance of the longer wave-lengths is paramount.

Now, in the production of candle-power the various rays of the spectrum do not count in proportion to their energy; the influence of the shorter, or more refrangible rays, is much less than that of the longer wave-lengths. Indeed, some of the rays of short wave length, at the extreme violet end of the spectrum, do not enter, to any appreciable extent, into the production of candle-power; yet these very rays often constitute a most important factor in the illuminating power of an arc light. This is what I mean when I say that the candle-power of an arc is not a measure of its illuminating power and that one lamp may have as much candle-power as another and yet have a much smaller illuminating power. As Dr. Nichols pointed out in a paper before this institute in 1889, candle-power is a well nigh meaningless term and may give us a very misleading value of the power of illumination of a light. He records a number of tests which prove quite conclusively that even though two lights have the same candle-power, the illuminating power of one may be widely different from that of the other. The reasons for this difference have already been given.

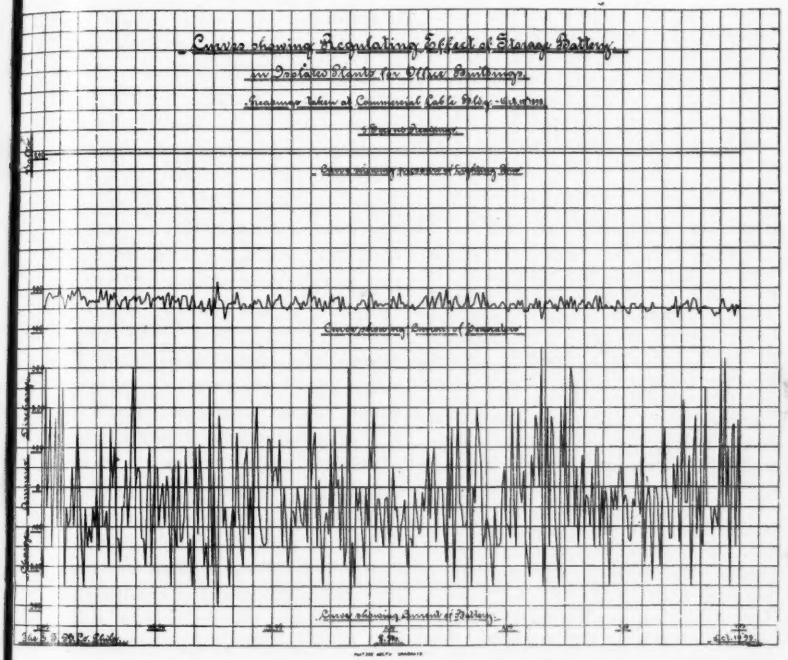

FIG. 3.—CURVES SHOWING REGULATING EFFECT OF STORAGE BATTERIES IN COMMERCIAL CABLE BUILDING, NEW YORK CITY.

PERSONAL.

Prof. Sidney H. Short has resigned the second vice-presidency of the Walker Company, and, it is reported, will make a trip to Europe.

Mr. Cornelius Gallagher, vice-president of the National Conduit and Cable Company, is making his maiden visit to Chicago this week, installing a large electric cable order for the West Side Street Railway Company.

Mr. George J. Jackson, of New York, is spending the Winter months in London, where, with his secretary, he is looking after the interests of the recently incorporated National Conduit and Cable Company, Limited.

Mr. W. H. Meadowcroft, of the Edison Lamp Works, Harrison, N. J., will deliver a lecture this Wednesday evening, before the Social Settlement of Orange Valley, at Orange, N. J., on "Liquid Air," illustrated with experiments.

Mr. Geo. A. McKinlock, of Chicago, and Mr. Geo. T. Manson, of New York, have just returned from a hunting and fishing trip in northern Michigan. It was too cold to catch fish, but several deers are reported to have succumbed to the prowess of these skilled sportsmen.

Mr. Frederick Saxelby, who is well known in the electrical trade and who formerly handled the Siemens-Halske apparatus in New York city and vicinity, has allied himself with the Bullock Electric Company, St. Paul Building, New York, and will hereafter handle their apparatus in the same territory.

Mr. Charles H. Kirkland, who has been identified with the sales department of the C & C Electric Company, has arranged to care for the New York interests of the Bibber-White Company and the Crefield Electrical Works, both of Boston. Mr. Kirkland's office for the present will be at 129 Greenwich street.

Mr. W. H. Baker, vice-president and general manager of the Postal Telegraph-Cable Company, has been laid up for several weeks with a severe attack of sciatica. His numerous friends in all parts of the country will be pleased to learn that he is improving and soon expects to resume his important duties at the head of the great telegraph company he so ably manages.

ELECTRICITY IN STREET CLEANING.

TO THE EDITOR OF ELECTRICAL REVIEW:

The recent snow-storm has brought about another storm, a regular cyclone of complaint and indignation at the utter breakdown of the Street Cleaning Department of New York city. Among the many excuses given for failure was the inability to hire carts, because most of the teams used in business wagons had to be doubled up. Hence it was not a scarcity of carts, but of horses.

Somewhere about $100,000 has been eaten up in the effort to clean away the snow, and somehow the snow is with us still.

Now, for that amount of money, the city could have made and own probably 100 automobile four-wheelers, with their motors and storage batteries complete, each capable of taking in tow six or eight ordinary carts loaded with snow, and taking them to the dumps in much livelier fashion than the poor cart-horse was ever known to accomplish. Once tried the plan would never be given up, for, unlike horses, automobiles do not eat their heads off in munching hay and oats in good weather. Besides, they could be used to very great advantage in street cleaning all the year round.

A half a million dollars thus expended would put the city in possession of the full equivalent of from 5,000 to 6,000 horses; and an equal amount would purchase enough carts to allow continuous loading, so that with enough shovelers the hauling could be done as fast as the great number of carts could be filled.

But the idea goes further. There would be absolutely no practical difficulty in having constructed a number of automobile and automatic electric machines for lifting the snow from the street and loading it into the trains of carts. Such a machine is almost embodied in the electric snow sweepers of the trolley companies.

With such an equipment a 10-inch snow-fall would present no difficulties, and the city would save many thousands of dollars annually to the taxpayers.

T. J. M.

New York city, December 3.

The Electro-Deposition of Copper.

[*From Engineering, London.*]

Though the science of electro-chemistry may be said to date back to the year 1807, when Humphrey Davy made his world-renowned discovery of the alkali metals, potassium and sodium, by aid of the electric current, yet it is only within recent years that extensive application has been made of the facts discovered by Davy, and his equally noted successor, Faraday, in the laboratory of the Royal Institution, London, over three-fourths of a century ago. The chief cause of this delay has, without doubt, been the high cost of generating the large currents of electricity demanded by the electro-chemist for the conduct of his processes upon a commercial scale. This hindrance has, however, been largely removed. The steam engine and dynamo have been constantly improved, and a guaranteed efficiency for the combined machinery of 85 per cent is now obtainable; while the generation of electrical energy from the hitherto wasted power of falling water has led, under favorable conditions, to the production of electricity at a cost much below that possible even with the best modern engine and dynamo plant.

The first electro-chemical industry to develop was that of copper refining; and this is the industry which has obtained the greatest magnitude. James Watt, in 1851, had patented a process and apparatus for the separation of the metals, copper and silver, in a pure state by means of electrolysis, but it was left to James Elkington, of the famous Birmingham firm of electro platers, to carry out the successful industrial application of Watt's ideas. The Pembrey Electrolytic Copper Refinery was built in the year 1869, and though this refinery has passed into other hands, and has undergone many improvements and extensions, it has remained at work down to the present date. The growth of this industry was slow during the first 15 years of its history, but it has undergone marvelous expansion since 1884; an expansion that has been partly due to the great demand for pure copper for electrical construction purposes, and partly to the energy with which the process has been exploited in the United States, where raw copper, peculiarly adapted for this mode of treatment, is obtained. It is estimated that there are 31 electrolytic copper refineries at work at the present time in Europe and America, and that over one-third of the total copper output of the world is now electrolytically refined. When one remembers that this signifies the electrolytic transport of the copper atom by atom across the space separating the elec-

trodes in the electrolytic vats, and that one cubic inch of copper contains roughly 60 thousand billion atoms, the enormous industrial growth and expansion of what many regarded as merely a laboratory method of purification becomes all the more striking. The electrolytic copper-refining industry owes its success very largely to the value of the so-called impurities of the raw copper. Nearly all copper ores, especially the pyritic ores of the western states of America, contain silver and gold, and when raw copper obtained from these ores is electrolytically refined, the silver and gold are found as an insoluble "anode sludge" upon the bottom of the vats. From this sludge these metals can be obtained as bullion by a comparatively simple and inexpensive chemical treatment. The value of the bullion recovered in one year by the Anaconda company, at their electrolytic refinery in Montana, was £730,000; and if one assumes that the average raw copper subjected to the refining process is only one-half as rich in precious metals as the Butte ores of Montana, the value of the "impurities" separated by the electrolytic process in all the refineries of Europe and America can not be far short of £1,679,000 per annum.

Not only is the copper improved in conductivity, and therefore in value, by subjection to this refining process, but silver and gold are obtained more than sufficient in value to cover the cost of the operation. A refining process which can show such results is certainly bound to find ready acceptance at the hands of metallurgists, and in the light of these facts the growth of the electrolytic copper refining industry is readily understood.

The method of refining adopted in all these electrolytic refineries is practically the same, though they exhibit differences in the details of electrode arrangement in the vats, and of current distribution. The raw copper is cast into plates of convenient size, and is suspended in a solution of copper sulphate, with thin sheets of pure copper on each side of it. When the current is passed through this electrolyte by means of these electrodes, using the raw copper plate as the anode, the copper is gradually dissolved from the latter and deposited upon the pure copper cathode, while the impurities of the raw copper remain in the solution, or pass into the anode slime. The deposited copper is usually of coarsely crystalline structure, and it is remelted in order to obtain the ingots which come into commerce. Further operations are necessary before this pure electrolytic copper can be obtained in the form of plates, tubes, or wire, and it was therefore natural that attempts should have been made in the past to obtain deposits of copper at the cathode which should be homogenous and dense in physical character, and possess the form of the final article or product desired.

The difficulties to be met and overcome in obtaining such deposits were, however, greater than was imagined, and it is only within the last two years that sheets and tubes of electrolytic copper, possessing the requisite density and strength, have been produced upon a commercial scale in the electrolytic bath. The processes by which these results have been obtained are both patented, and are in the hands of companies who are now working them on an industrial scale.

The older process—the Elmore process—is protected by patents—No. 12,264, 1888; No. 2,618, 1889; Nos. 7,932 and 18,896, 1890; Nos. 5,167 and 17,631, 1891; and No. 7,222, 1896. It is worked in this country at Leeds; at Dives, in France, and at Schaldern, in Germany.

This process has for its aim the production of seamless tubes of pure copper, by the electrolytic deposition of the metal upon a revolving mandril of suitable diameter, this mandril acting as the cathode in the electrolytic vat. The earlier patents described a method of obtaining a smooth and dense deposit by the application of pressure from traveling agate burnishers, but this method has been found in actual practice to cause foliation of the deposit, and much time and money have been expended by the Elmore companies in overcoming this defect in their process. A satisfactory tube, free from all defects observed in tubes made by the original process, is now said to be obtained by modifications—many of them unpatentable—worked out by M. Secretan and by Mr. J. O. S. Elmore. We have not been able to obtain any tests of the strength of the more recently produced tubes, but that these are satisfactory is proved by the increase in the sales of the Elmore companies, and by the fact that the Anaconda Copper Mining Company is negotiating for the purchase of the patent rights of the improved process for the United States of America.

At Leeds the Elmore Copper Depositing Works have a production capacity equal to 120 tons of electrolytic copper per week. The capacity of the factory at Dives, in France, is 200 tons per week, while in Germany, the Schladern Works can produce 35 tons of copper weekly.

The second process is that known as the "Dumoulin" process, and was the invention of one of the chemists employed in M. Dumoulin's laboratory in Paris. It is protected in this country by Patents No. 16,360, 1895; No. 9,289, 1896; Nos. 2,709–2,712, 1897, and is the property of the Electrical Copper Company, of London, who have recently erected a large works at Widnes, Lancashire, for trial of the process upon an extended industrial scale.

This process obtains smooth and dense deposits of copper at the cathode by the application of a thin insulating coating to the inequalities that form on the surface of the metallic deposit. As before, the copper is deposited upon a revolving mandril, but only one half of this is immersed in the electrolyte. The insulating material is applied by "impregnators," which have a longitudinal movement over the surface of the deposit, and coat all projecting parts with a thin film of animal matter. This film hinders further deposition until the surrounding depressions have been raised to the common level. The insulating film is being removed continuously by the oxidizing action of the air and of the electrolyte, and thus deposition of copper can occur again upon any part, as soon as it has ceased to be coated by the animal matter out of the "impregnator."

The Electrical Copper Company are at present producing sheet copper only by this process at Widnes. Revolving mandrils, 12 feet long by 16 inches in diameter, are used in the electrolytic vats, of which 30 are at work. When the deposit of copper has attained a thickness of one-sixteenth of an inch, the copper tubes are removed, and are cut longitudinally. In this manner copper sheets are obtained measuring four feet by 12 feet, and possessing very satisfactory characteristics as regards density and strength. The copper is almost chemically pure; its specific gravity varies from 8.96 unannealed to 8.89 annealed; its tensile strength varies from 36,000 pounds up to 53,000 pounds per square inch, and its elongation from 10 up to 30 per cent.

The sheets are applicable to all ordinary purposes, and are sold at the same price as ordinary sheet copper. The Electrical Copper Company intends shortly to demonstrate the applicability of the Dumoulin process to the manufacture of boiler tubes and other hollow articles. The generating plant consists of five Peach direct-acting high-speed engines, running at 460 revolutions under a pressure of 150 pounds. Each engine is of 160 indicated horse-power, and is directly coupled to a Crompton dynamo. The depositing plant consists of the 30 vats, with tanks for settling, filtering and cooling the electrolyte. The circulation is effected by gravity, the electrolyte being pumped into storage tanks at a high level, from which it flows continuously through the system of depositing vats.

That these two processes can turn out satisfactory products, so far as physical and chemical characteristics are concerned, has now been placed beyond doubt, and their future success depends solely upon the economic factor in their operation. It may be pointed out here that, in both cases, the value of the "impurities" found in the anode slimes will materially affect the results; and, as in the older electrolytic copper-refining industry, success will largely depend upon obtaining raw copper for use as anodes which is rich in its contents of silver and gold.

Europe can no longer look to the States to provide the raw material of the industry, since the electrolytic refineries of North America now absorb practically the whole of their output of argentiferous copper. British Columbia and Tasmania are, however, coming forward as copper-producing countries, and it may be found possible to draw from these new districts that supply of suitable raw material which is necessary for the successful operation of the electrolytic copper refining industries.

HIGH-VOLTAGE POWER TRANSMISSION.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, OMAHA, JUNE 30, 1898, BY CHAS. F. SCOTT.

(*Continued from page 341.*)

The first tests were qualitative rather than quantitative. It was uncertain what phenomena might accompany the operation of a long line at high voltage, and the pressure which could be used on the insulators was a matter to be determined. The first thing was to find what would work; measurements could be made afterwards. A high voltage was placed on the transmission line, sometimes transmitting no power and at other times operating the 100 horse-power synchronous motor. In December, 1895, the motor was operated at 25,000 to 33,000 volts for several days. In January, 1896, 45,000 volts was used continuously for over a week, and beginning with the latter part of March a continuous run of 37 days was made at 50,000 volts. "Some very severe conditions of weather were encountered during this time, very high gales of wind prevailed, the air was filled with clouds of dust, part of the time the snow which fell was quite damp, and during the last few days of the run there was some rain. At this voltage the wires were plainly visible at night and the characteristic hissing of high-tension currents could be heard several hundred feet. No lightning arresters had been installed up to this time, and the cause of the shut-down was damage to the raising transformer, caused by lightning. Lightning arresters were installed. The lightning season commenced about June 1. During the latter part of June lightning discharges over the arresters were very frequent. At this time we were limited to a running voltage of about 34,000 volts, as there were not enough arresters to permit of increasing the voltage. No trouble whatever was had with the lightning protection. Discharges were frequently seen crossing the arresters and during two or three days in the early part of the season discharges occurred at intervals of a few seconds for several hours. Enough arresters were afterwards obtained to run at 45,000 volts, but the lightning discharges were much less frequent."

Some measurements upon the line were made by determining the power to the raising transformers when the lines were connected and when they were disconnected. These measure-

ments showed that the loss due to the line is small, below 45,000 volts, but increases rapidly when about 50,000 volts is exceeded, and reached 16.4 kilowatts at 59,000 volts. The results up to 52,000 volts are given in Curve 2, Fig. 9. Curve 1, in this figure, is the loss on the same circuit

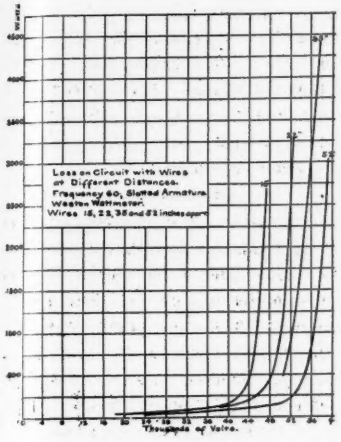
Loss on Circuit with Wires at Different Distances.
Frequency 60, Slotted Armature.
Weston Wattmeter.
Wires 15, 22, 35 and 52 inches apart
Thousands of Volts.

FIG. 6.—"HIGH-VOLTAGE POWER TRANSMISSION"—INSULATION TESTS.

measured a year later by a different observer using a different method. At the maximum loss shown there is a difference of only eight or nine per cent in electro-motive force for the same loss on the two curves.

The record of the operation of this line at 50,000 volts for over a month is of very great interest, as it is a practical demonstration of the feasibility of operating a line at 50,000 volts, a pressure four or five times as great as any which had been in general commercial use. Mr. V. G. Converse had been up to this time closely associated with this work. He had much to do with the design and construction of the high-tension transformers and insulators, tests upon losses in lines made at the Pittsburgh laboratory and the tests at Telluride.

The work at Telluride was then taken up by Mr. R. D. Mershon. The facilities for experimental work were increased, and instruments were provided for carrying on the tests. Mr. Mershon found peculiar difficulties in making exact measurements of the power to the circuit. A wattmeter in the low tension circuit of the raising transformer led to errors under the conditions which prevailed. Some very able and painstaking work was displayed in detecting the error and overcoming it with the facilities at hand—and the facilities were none too plenty in the heart of the Rocky Mountains for making measurements which would tax the resources of almost any laboratory. The apparatus used introduced a disturbing influence in the circuit, which, however, could be measured and eliminated. On the other hand, a wattmeter for measuring power on a high-tension circuit must accommodate a very high voltage and a very small current. As the charging current to an open line is usually very large in proportion to the loss current, the error of the instrument is very sensitive to slight variations of phase in the shunt current. A description of the instruments and the methods used are given in an extract from the report of Mr. Mershon, which will be found at the end of this paper in Appendix A. The results of the measurements and the conclusions are given partly by extracts from Mr. Mershon's report, and partly in abstract.

"The results of measurements taken are embodied in curves.

"In every case the measurements were taken upon an open-circuited

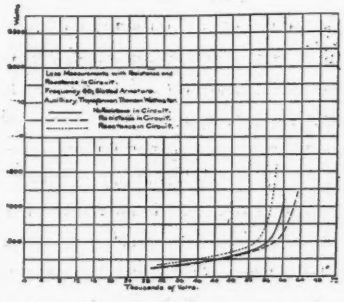
Loss Measurements with Resistance and Reactance in Circuit.
Frequency 60, Slotted Armature.
Auxiliary Transformer. Thomson Wattmeter.
Thousands of Volts.

FIG. 8.—"HIGH-VOLTAGE POWER TRANSMISSION"—LOSS MEASUREMENTS.

line—in no case upon a line which was transmitting power. The line losses obtained are therefore a combination of those occurring between the line wires and the very small I^2R loss in the wire itself due to the charging current of the line.

"Measurements taken with the Weston wattmeter include the loss in the high-tension coil of the power transformer due to the currents applied to the line. This loss is, in general, small, and in the following curves corrections have not been made for it. Curves taken with the Thomson wattmeter require no such correction.

"There is an additional correction which may be made in the case of those curves whose voltages were obtained from the raising transformer. This correction arises from the fact that the action of the capacity current taken by the line, in connection with the series reactance of the transformer supplying it, is such as to make the voltage impressed upon the line somewhat greater than that obtained by the ratio of the transformer winding. The measurements taken to determine the amount of the error in voltage show it to be small.

"There were two generators used. One was that regularly running and supplying power to the power circuits of the Telluride Power Transmission Company. It is a 600-kilowatt, 22-pole, quarter-phase machine, delivering 500 volts at a frequency of 60, or 7,200 alternations per minute. Its armature is of the slotted type and is wound with copper bars. In the notes this generator is designated as 'slotted armature.'

"The other generator is one whose field is that of the 100-kilowatt toothed armature machine, originally sent out as a part of the first Gold King transmission plant. It has 12 poles, and, as originally run, operated at 3,000 volts and 10,000 alternations. There are two armatures for this machine; a surface-wound armature, designated as 'smooth armature,' and a toothed armature, designated as 'toothed armature.'"

Comparison Between Insulators—A set of measurements was made for comparing the loss on the three circuits supplied, respectively, with large glass, small glass and porcelain insulators. The curves are very nearly identical, and correspond very closely with the right-hand curve in Fig. 6. "There was a heavy wet snow on the ground and the cross-arms at the generating station, and more or less snow all along the line; that at the further end being drier

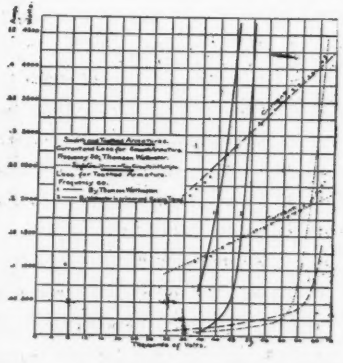

FIG. 9.—"HIGH-VOLTAGE POWER TRANSMISSION"—LINE LOSS TESTS.

than at the generating station. There was more or less snow falling during the measurements, and this accounts for a wide variation of the points taken at the high voltages, as falling snow renders the wattmeter reading very unsteady, the unsteadiness being such as one might expect, if from time to time, there was a discharge between the wires. This unsteadiness does not seem to be as great in the case of falling rain as in the case of falling snow."

Loss and Distance Between Wires—A series of measurements was made to determine the connection between the loss and the distance between wires. "As, at that time, it had not been fully demonstrated that the loss was not affected by weather conditions except there was precipitation, changes in distance between wires were made upon one circuit, while the distance between wires on another circuit was maintained always the same, and the latter was used as a reference circuit when a change in loss was obdinate."

The several curves have been plotted together, due correction being made for the slight difference in the loss in the reference circuit, which probably resulted from slight differences in the precipitation when the curves were taken. The distance between the wires in the several tests was 15, 22, 35 and 52 inches, respectively. The results are shown in Fig. 6. It will be noted that the loss is much greater when the wires are close together, and that the curve begins to ascend at a lower voltage.

Comparison of Wattmeters—The loss curves in Fig. 7 were taken on one of the circuits; first, with the Weston wattmeter and then with the Thomson wattmeter. The Weston wattmeter was not in circuit when the measurements with the Thomson wattmeter were taken. As an additional check, the readings were taken on each of the wattmeters of the loss occurring in the shunt resistance, of the Thomson wattmeter the results were in practical agreement with each other and with those obtained by calculation. The discrepancy in the results obtained on the two instruments when measuring line loss will be referred to later.

Loss on Insulators—A set of comparative readings was taken on one of the circuits and on a dummy circuit, identical with the main circuit, as regards kind and number of insulators and the size of wire, but only 60 instead of 11,720 feet in length. The results show that the loss on the two circuits is practically identical up to about 50,000 volts, which is the part of the curve below the bend. The losses agree closely with those shown in Fig. 6. At high voltages the loss on the dummy circuit increased slightly, indicating that the loss was of the same nature as that of a lower voltage. The agreement of the loss

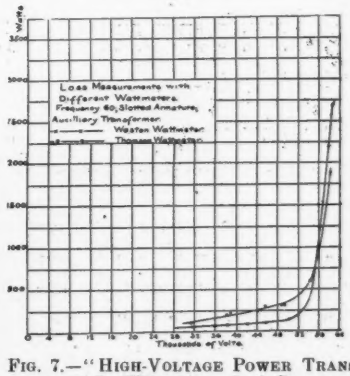

FIG. 7.—"HIGH-VOLTAGE POWER TRANSMISSION"—WATTMETER LOSS CURVES.

on the two lines at low voltage (i. e., below the bend in the loss curve) indicates that this loss was over the insulators. The great increase in loss on the long line at high voltage indicates that the loss was due, not to the insulator, but to the line.

(To be continued.)

Electrical Review

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SPECIAL NOTICE TO ADVERTISERS.
CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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The electric lighting interests of the United States should bear in mind the next meeting of the National Electric Light Association, which will occur early in the new year. The convention will be held in New York city and the programme of addresses and papers will be the most interesting and valuable ever read before the association. Central station men should see to it that a large attendance of members and delegates is present.

COMPRESSED-AIR STREET RAILWAY MOTORS.

That the Metropolitan Street Railway Company is behind the pending application of compressed-air motors on the Twenty-eighth and Twenty-ninth street line is said to be a fact. It is also said, as has been said many times lately, that compressed air is the *ne plus ultra* for lines of moderate length. Certain improvements are claimed to have been made which clear away all difficulty, and the air motor is said now to drive everything before it, not even excepting the admirable electric motor. But we believe that a few grains of salt should accompany such statements. The improvements alleged are in the way of storing the air, at exceedingly high pressure, in steel tanks or cylinders; and, to avoid freezing of valves by the expansion of the air, some method of heating the air before expansion or during the exhaust is to be used. The air is to be carried in steel cylinders or bottles at a pressure of 2,000 pounds per square inch.

It is the same old, old story. Always some street railway company is just about to adopt compressed-air motors, but somehow the motors do not get adopted. In this connection, it is curious to turn back to a period over 20 years ago, and most interesting to find the same assertions made that we read to-day as new. A publication, which next year will be old enough to vote, told of the wonderful work done in 1878 by the Pneumatic Tramway Engine Company, of 317 Broadway, under the patents of two Scotch engineers, Robert Hardie and J. James. Among other things, it says:

"These (the reservoirs) are of steel and are tested up to a strength many times greater than their working pressure, and it is claimed that there is no danger of explosion. The cars now building (five) will be larger and contain reservoirs of much greater capacity, and it is claimed that there will be no difficulty in constructing them so that the round trip from Harlem River to Peck Slip can be made without replenishing."

During that same year, Mr. Henry Bushnell, of New Haven, produced a "successful" air motor. He worked with air at a pressure of 1,800 pounds per square inch, stored in long tubes with welded ends, and he also heated the working cylinders to prevent freezing of the valves. His car operated "successfully on the Whitneyville road, and ran at times about twice as rapidly as a horse car."

Here are about all the features of novelty that can be asserted of the motor system in process of adoption on the Twenty-eighth and Twenty-ninth street line, and yet we are told it is brand new and will be highly successful.

On one hand we are told that the air motor is really successful at last, after all these years of alleged successful trial; that it is owned by a powerful clique and is to be forced upon the Metropolitan Street Railway Company, to the everlasting fattening of the pockets of the owners.

On the other hand it is said that the Metropolitan company, while having no serious intentions in the direction of compressed air, believe the electric motor people want too much profit out of any general adoption by that company of the electric system of propulsion, and is spending some money to force the electric people to better terms. True, the Metropolitan company has adopted the underground trolley system on several of its lines; but, summed up, the mileage of these lines is but a trifle compared to the miles of horse and cable car service still to be modernized and transformed into the underground trolley system. And the Metropolitan company can well afford to spend thousands of dollars in the effort to force the electric people to lower prices.

The manufacturers of electric railway motors and appliances are wide-awake and know all about all the compressed-air systems of traction, and, for that matter, all other systems. It is their business to know, and know thoroughly, and we imagine they are not losing any sleep over the threatened inroads on their business by compressed air.

If you wish to have your young friend remember you gratefully 52 times during 1899, subscribe for a copy of the ELECTRICAL REVIEW and send to him.

Twenty years ago last month, November, the first Brush arc dynamos were placed on the market. The electric light pioneers will all remember the sensation they created. It was the beginning of an entirely new departure in the field of illumination.

A New England college professor gravely writes that he does not believe Tesla can operate his teledynamic vessel by "mere act of his will." No one does, and Tesla least of all. Before accusing this inventor of making such a remark, the educator might at least have tried to have it confirmed or denied.

In another column a correspondent of the ELECTRICAL REVIEW advances the novel idea of employing electric automobiles for hauling carts used in removing the snow from city streets. The fact that, during the recent blizzard, the electric cabs in New York performed satisfactory service in spite of the heavy snowfall lends weight to the suggestion.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

On the New York Stock Exchange, General Electric closed at 84¾ bid and 85 asked, a gain of 2½ points for the week. Western Union closed at 93¼ bid and 93½ asked, a gain of ¼ point for the week. On the Boston exchange American Bell Telephone closed at 280 bid and 282 asked. Erie Telephone closed at 75 bid and 75½ asked. On the Philadelphia exchange Electric Storage Battery common closed at 54⅛ bid and 54⅜ asked.

It is reported that a comprehensive plan for the consolidation of all the Brooklyn, N. Y., trolley companies, the readjustment of the capitalization and bonded debt of all the underlying companies and a possible arrangement with the Kings County Electric Light and Power Company to furnish electric power for the combined railroad system has been conceived, and is believed to be very near a consummation. Kings County stock is now quoted at 153.

The directors of the General Electric Company have declared a dividend of $17.50 on the preferred stock. This pays up one-half of the arrears, leaving yet to be paid up to August, 1898, $29 per share. The books close December 12, and reopen December 23.

There is a belief in Wall Street that the January dividend on Metropolitan Street Railway, of New York, will be at the rate of 7 per cent instead of 5 per cent. The earnings of the company are said to fully justify this increase in the dividend, and the stock is expected to discount not only the increase to 7 per cent, but very much larger earnings resulting from the completion of the Sixth and Eighth avenue lines downtown.

Wall street, December 3.

ANSWER TO AN INQUIRY CONCERNING TESLA'S LATEST INVENTION.

In the ELECTRICAL REVIEW last week appeared an inquiry from Mr. N. G. Worth, of Indianapolis, relating to a probable defect in the electrically-controlled vessel recently patented by Nikola Tesla. Mr. Worth inquired if the ship or fort menaced could not set up a counter-influence by means of similar apparatus, which would be more powerful at a nearer radiation than that transmitted to the attacking vessel from the distant point where the original and controlling influence was created. A number of electrical experts and the inventor himself have been consulted on this point, in addition to a careful perusal by the writer of the technical description of the invention which appeared in full exclusively in this journal on November 9 and 16. The following passage from the patent, in which the italics are our own, is republished as bearing on this question:

"It will be obviously noted from the preceding that, whichever of these or similar contrivances be used, the sensitiveness and, what is often still more important, the reliability of operation are very materially increased by a close adjustment of periods of vibration of the transmitting and receiving circuits, and, although such adjustment is in many cases unnecessary for the successful carrying out of my invention [Tesla evidently refers here to the many uses of his invention in peace—ED.] I nevertheless make it a rule to bestow on this feature the greatest possible care, not only because of the above-mentioned advantages, which are secured by the observance of the most favorable conditions in this respect, but also, and chiefly, with the object of *preventing the receiving circuit from being affected by waves or disturbances emanating from sources not under the control of the operator.* The narrower the range of vibrations, which are still capable of perceptibly affecting the receiving circuit, the safer will the latter be against extraneous disturbances. To secure the best result it is necessary, as is well known to experts, to construct the receiving circuit, or that part of the same in which the vibration chiefly occurs, so that it will have the highest possible self-induction and, at the same time, the least possible resistance. *In this manner I have demonstrated the practicability of providing a great number of such receiving circuits—50 or 100 or more—each of which may be called up or brought into action whenever desired without the other being interfered with.*

The above statement answers part of the question to the point, for, if the sending and receiving circuits are skillfully adjusted, the enemy attacked would be practically powerless, as he could only by the barest chance strike the vibration to which the receiving circuit on the vessel would respond. It is difficult enough, even for the best expert, to make an exact adjustment of two such circuits, let alone the far more difficult problem which in this respect would confront the enemy attacked. Granted he had an apparatus on board capable of developing electrical waves of any pitch, still he would never be able to know which of the notes struck is affecting the circuit on the assailing vessel, since this effect would be only momentary and speedily counteracted by the sending apparatus which the operator guiding the vessel in its course is controlling.

But, quite apart from the above, let it be assumed that such adjustment of the sending and receiving circuits was not at all observed, and that no agents were known capable of affecting a sensitive device on the Tesla vessel, which agent, by its very nature, made it impossible for the enemy to ward off the attack. The latter supposition is manifestly untrue, since any radiation propagating in straight lines, as light or short Hertzian waves, may be used for operating the vessel, and such radiations may be screened off on the side towards the enemy, so that the latter could not affect the controlling device on the attacking vessel. Still, even in such an extreme case, it would seem to us that, while it might be easy to disturb the dot and dash signals in wireless telegraphy, it would be quite a different matter to prevent an operator from directing his vessel to wherever he desires, for *he* only would know precisely how the signals affect the mechanism, whereas the supposed opponent would have no knowledge whatever in this respect and could never tell whether, in working his apparatus, he is aiding or thwarting the efforts of his assailant. However, his signals would be of telling effect only after the assailing vessel had reached a point at which the signals from both the sources are of equal intensity. Now it would be quite easy, in our opinion, for the operator controlling the course of the vessel and the operation of the apparatus on board of the same, to direct it straight upon the enemy, put the machines at top speed, release the exploding mechanism and render all further signals inactive. Since the vessel can carry any amount of explosive, it would not be necessary to come very close to the enemy to insure his destruction.

How about the intensity of the signals? Can the signals from a man-of-war be made as strong as from a vessel especially fitted for this purpose? Would it be advisable to have such a powerful apparatus on board of a warship when the experts tell us that powerful electrical vibrations are apt to make large sparks fly about in any part of the structure, thus becoming liable to short-circuit the light mains and injure any of the important electrical apparatus on board, and, worst of all, inflame the stores of explosives? Would any commander undertake the responsibility of operating such a powerful apparatus on board of his ship under such conditions? And anyway, how is he to know to what kind of influence the controlling device on the assailing vessel is designed to respond? And granted he does, will he feel sure to start his apparatus going when there might be a vessel submerged in the neighborhood responsive to his signals and ready to ignite a great quantity of explosive, and to so annihilate his costly ship and living crew? How would he know that, by his own signals, he is not drawing upon his ship one of the vessels especially adapted for such purpose, thus bringing destruction upon himself through his very efforts to ward off the danger? Would he not expose himself to such liabilities, particularly at night? A great many more of such arguments might be made if they were needed, and all of this, it seems to us, has been overlooked in the various comments we have perused. It is well known that most of the naval engagements must of necessity take place near the coast. Now it is not difficult to employ on shore a sending apparatus, fixed or portable, of great power, against which any on board of a warship would be ineffective, and we ask again how could a commander of a fleet possibly venture to approach the coast within 10 or 15 miles when he would know that in so doing he is risking not one but all of his vessels?

Our inquirer is mistaken in the belief that the use of the coherer is indispensable in Tesla's invention. The inventor is very explicit on this point, as will be observed by perusing his text. To cite only one passage, he states:

"A great variety of electrical and other devices, more or less suitable for the purpose of detecting and utilizing feeble actions, are now well known to scientific men and artisans, and need not be all enumerated here. Confining myself merely to the electrical * * *"

Those who have criticized this important advance seem to confound a special means for carrying out the invention for the invention itself. The latter is not limited to any particular mode of signaling, and on this point Tesla expresses himself clearly, as may be seen from the following quotation:

"Finally, I may avail myself, in carrying out my invention, of electrical oscillations which do not follow any particular conducting path, but propagate in straight lines through space, of rays, waves, pulses, or disturbances of any kind, capable of bringing the mechanism of the moving body into action, from a distance and at the will of the operator, by their effect upon suitable controlling devices."

Signaling without wires, in some way or other, is very old—in fact, ancient—whereas Tesla, as we have before stated, has created an art entirely novel, for there never was such a thing as guiding the movements of a distant body and controlling all of its appliances without any artificial connection whatever.

It is, perhaps, astonishing that this epochal idea has not been evolved in times long past, for it would seem that it might have been carried into effect, without the use of any electrical means whatever, by some scientific men of old, like Archimedes. He must have known, for instance, that by striking a shrill note he could set into vibration a delicate reed or diaphragm at a distance of as much as two or three miles, and he might have known that the force so developed could be utilized, in many ways, to control the movements of a rudder or other device on a vessel, and that by such control the vessel could be guided upon the enemy's ship and the latter destroyed, as by ramming into it, or by causing, for example, a large quantity of inflammable fluid to flow on the water and then igniting the fluid through a contrivance actuated by the signal from a distance, far out of the reach of the enemy's weapons. When gunpowder was discovered, and when we gained knowledge of voltaic electricity, it became still more easy to carry out the idea. When the action of light on a selenium cell was observed, a simple means was offered for effecting the control at great distances. The observation that currents are propagated through the ground to considerable distances and that inductive effects take place between circuits widely apart, again enlarged the possibilities, until finally the science of electrical vibrations and synchronized circuits afforded the best means for carrying the idea into practice. These means, which are accessories in this invention, will, in all probability, multiply and be further improved as time goes on, and, with every advance in this direction, this new art will be brought to greater perfection.

To one who considers that for centuries past a large proportion of human effort has been spent in devising and producing the most efficient means for destroying an enemy, the tremendous importance of this new departure is instantly impressive. The weapon is no longer one dependent on the chance of hitting, nor one subject to the limitations of the modern projectile, nor one which can be rendered inoffensive by armor protection, however thick. The mere moral effect of a weapon of unlimited powers of destruction must be so great as to lead to a radical change in warfare, first on sea and next on land, but its success in the end can not help compelling the nations, for the sake of humanity, to stop the slaughtering of men and sacrifice of property.

Major Joseph H. Francis, who for many years had been connected with the New York Telephone Company and its predecessor, the Metropolitan Telephone and Telegraph Company, died at his home in Passaic, N. J., on November 28. Major Francis was well known among telephone people, having been engaged with several of the Bell licensee companies. While with the New York Telephone Company he was connected with the right of way department as agent. He had not been on active duty for some months, although he was an employé of the company up to the time of his death.

The New Telephone Building in Brussels.

United States Consul Geo. W. Roosevelt writes from Brussels, Belgium, as follows:

"There has recently been erected in this city a spacious building to be devoted exclusively to the telephone service of the country, and, as now expected, it will be open to the public some time during the coming year. The building is situated in the old quarter of the city, the selection of the location being, no doubt, influenced by economical reasons, as the land was government property. The construction of the building has cost very nearly 1,000,000 francs ($193,000), and there will be commutators for 15,000 subscribers.

"The building comprises a basement, ground floor and three stories. The room devoted to the commutators has a length of 147 feet, a width of 65 feet, and a height of 30 feet. The various stories are reached by two stairways, one of generous proportions exclusively for the public, and the other of narrow dimensions, devoted to the use of the personnel of the service. When the building is entirely completed and ready for public use each subscriber will have connection with the central by a double wire.

"On account of the large number of overhead traction cables already existing in this city and the impossibility of a much further increase in the number or dimensions of telephone support frames (chevalets), it has been decided to put nearly all the wires of the Brussels telephone service under ground, and, in consequence, cables containing 200 wires will be placed in underground conduits, to be distributed in the various quarters of the city. When necessity presents, one or more of these cables will be carried overhead, attached to a chevalet placed on a housetop and distributed to subscribers in that locality.

"The building will be heated by the system (patented) of Mr. L. d'Anthonay. A gas machine of three horse-power will operate a turbine, which forces cold air in the heating apparatus and drives it into the various rooms when at proper heat and moisture. This system permits the admission of air wherever desired. It reduces to a minimum the amount of humidity and dust resulting from heating and ventilation, two causes exercising the most harmful influence upon the working of apparatus for telephonic communication. Another advantage resulting from this system of heating is the power of cooling the air in the building during the Summer.

"Below the massive concrete foundation, a series of iron rafters has been laid to facilitate the flowing of electricity into the ground. Steel shanks are attached to these rafters and connected with the iron pieces of the building in all directions in such manner that the entire construction is united in a Faraday cage, which thoroughly protects it against lightning.

"Every possible precaution has been taken to render the building fireproof. A large number of fire-escapes will also be added."

Suits on Electric Meters.

Several important patents affecting the subject of electric meters have recently been sustained by the Circuit Court for the Eastern District of New York. These patents are the two Tesla transmission patents Nos. 511,559 and 511,560, the two Shallenberger meter patents numbered 388,003 and 388,004, and the Elihu Thomson meter patent No. 448,894. The Diamond meter, put upon the market by the Diamond Electric Company, of Peoria, Ill., was the object of attack in all of these suits. The defendant company was the Citizens' Lighting Company, of Brooklyn, N. Y., to which company the Diamond Electric Company, was at one time joined as defendant in the case of the Shallenberger patents. Before the decision was rendered the Diamond Company was withdrawn. The complainant bringing suit under the Shallenberger patents was the Westinghouse Electric and Manufacturing Company, that under the Tesla patents was the Tesla Electric Company, and that under the Thomson patent was the Thomson-Houston Electric Company. Decrees were entered and injunctions issued under all the above-mentioned suits on November 28.

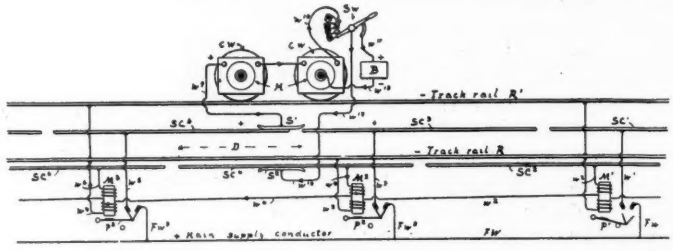

FIG. 7.—"SURFACE CONTACT ELECTRIC RAILWAYS"—METHOD OF GUARDING AGAINST LEAKAGE CURRENTS.

As to Hollering.

[*From an unidentified exchange.*]

"The man who whispers down a well
About the goods he has to sell,
Won't reap the gleaming golden dollars,
Like one who climbs a tree and hollers."

West End Street Railway Company of Boston.

[*From the Boston News Bureau.*]

The operating expenses of the West End Street Railway system have of late years been a subject of considerable interest at various times in connection with the company's finances. The criticism has been made that the company was charging more to the operating account than a conservative operation demanded.

It has been the expectation in some quarters that for the year ended September 30, 1898, the operating ratio would show a material reduction from that of the years immediately preceding. Last year's figures, however, do not indicate any reduction, the ratio being 71.5 per cent against 71.3 per cent in 1897 and 76 per cent in 1896. We tabulate below the principal items entering into the operating expenses for the past three years:

	1897-8	1896-7	1895-6
General expense	$790,320	$466,170	$463,318
Main. roadways, etc.	1,150,726	1,152,252	1,276,889
Main. equipment	624,542	611,998	935,153
Transportation	4,000,987	3,983,287	3,686,259
Total	6,566,575	6,213,707	6,334,619
Per cent of gross earnings	71.5%	71.3%	76.0%

This operating ratio of 71.5 per cent compares with an average of 64 per cent for the seven largest street railways in Massachusetts next in size to the West End Road. The Lynn & Boston Road, in fact, was operated last year for 58 per cent of gross earnings.

We present below a 10-year comparison of West End figures, which will at a glance show the remarkable growth of the system during this period:

	Gross Earnings.	Passengers Carried.	Car Miles.	No. of Pass. Cars.
1898	$9,179,096	181,321,295	32,209,150	2,840
1897	8,719,031	172,554,513	29,786,936	2,648
1896	8,341,958	166,862,288	25,841,907	2,422
1895	7,746,170	155,231,506	22,180,125	2,255
1894	6,823,879	137,028,449	19,240,486	2,113
1893	6,692,578	133,863,618	18,669,809	2,170
1892	6,317,205	126,210,781	17,498,660	2,254
1891	5,968,984	119,264,401	17 462,572	2,131
1890	5,780,082	114,653,081	17,665,360	2,031
1889	5,249,902	104,243,150	16,573,831	1,841

During these 10 years gross earnings have increased 75 per cent; number of passengers carried has increased 77 per cent, and car equipment numerically has been increased 54 per cent.

LITERARY.

Every American will be interested in a page of photographic reproductions in the Christmas *Ladies' Home Journal*, which presents "Mary Anderson in Her English Home." The pictures were made expressly for the *Journal*, and show Mary Anderson de Navarro as she is to-day, her two-year-old son, and the exteriors and interiors of the De Navarros' delightful English home. These pictures will be treasured by the beloved actress's admirers in this country, as they give an interesting glimpse of Mrs. de Navarro's daily life and her surroundings.

The proposed Personnel Bill recognizes the necessity, which is obvious to-day and which will grow more so in the future, that the naval officer should be an engineer as well as be proficient in ordnance and in navigation and in the other duties incidental to command. When one realizes that from one-fourth to one-half of the crew of our ships is in the engineering department, one appreciates how important it is that the commanding officer should widen his curriculum of study, and understand the tools and the machines, and the power which runs them and runs the ship, so as to make himself indeed an officer worthy to command. One of our prominent captains in the navy said substantially, not long ago, that, if he had any timidity and fear when in command of a great battleship, it arose from his ignorance as to what might occur in the engine-room when he had given his signal from above.—From "The Reorganization of the Naval Personnel," by the Hon. George Edmund Foss, chairman of the Subcommittee on Personnel of the House Naval Committee, in *North American Review* for December.

American Steam Engines Wanted in France.

Consul Jackson writes from La Rochelle, November 9, 1898: "There is an opening in this consular district for several steam engines and boilers of American make. The engines must be 35 horse-power, and the boilers must be capable of supplying these engines. The prices, including cost of transportation, etc., to this district, or Tonnay-Charente, should not exceed those asked here (about $2,000). Correspondence, with specifications and prices, should be addressed to Mr. Grenfel Stewart, 13 rue du Palais, La Rochelle, France."

The Greenfield, Ind., City Council has purchased the plant of the Greenfield Electric Light and Power Company, the consideration being $16,000.

SURFACE CONTACT ELECTRIC RAILWAYS.

READ BEFORE THE NEW YORK ELECTRICAL SOCIETY, NOVEMBER 17, 1898, BY EDWARD H. JOHNSON.

(Continued from page 346.)

Experiments with the sectional rail system developed the imperative necessity for a "time allowance" for the operation of the switches before demanding current of the successive contact buttons or rails as the car progressed. This demand for time allowance is, of course, increased as the speed is increased. It is a fact that, without such provision, a car running 10 or 12 miles per hour would "run away" from the current; that is to say, the car would pass over a button so quickly that its switch would not have time to act, and, consequently, the motor current not only failed, but destructive sparking at the switch contacts ensued. It is, of course, apparent that, in the case of high-speed trunk-line roads, this defect would be fatal. As to the efficiency of the means employed to give the requisite time allowance in a reliable and positive way, it needs only that the fact be stated that the current employed for actuating any given magnet is carried forward to and utilized in actuating the next succeeding one. If, therefore, the current employed is sufficient to energize the first, it must of necessity be sufficient for the next, thus insuring the operating simultaneously with the first and not at some indefinite period thereafter.

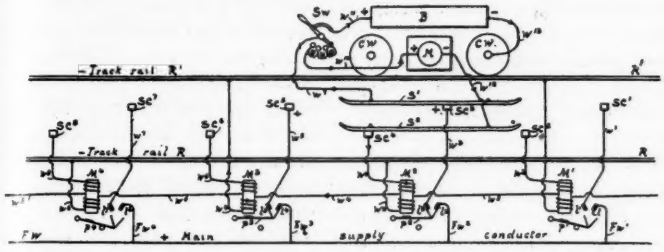

FIG. 8.—"SURFACE CONTACT ELECTRIC RAILWAYS"—INTERCONNECTIONS BETWEEN OPERATING SWITCH COILS.

The connection diagram, Fig. 8, will fully illustrate the manner of interconnections between the operating switch coils. For instance, the current will flow (see diagram) from sectional conductor SC^4 through wire W^4 through upper coil of magnet M^2, then by the interconnecting wire W^4 around the lower coil of magnet M^3 to track rail.

In the progress of development ensuing from the continuous chain of experiments conducted by us, many deficiencies, not otherwise discoverable, were made manifest. Among these were the following:

1. The fact that the surface leakage from the high-potential button to the track rails would suffice to keep the switch magnet energized if it were in the circuit between the main feeder and the high potential button. This led to a complete reconsideration of the electrical circuits. To remedy the difficulty the switch magnet was finally placed in circuit between the motor and the track rails, instead of between the high-potential button and the motor, thus ensuing the absolute isolation of the switch magnet after the passage of the car. This was a new provision against the hurtful effects of leakage, as will be seen from this statement of its specific purpose and function, and quite different and apart from that provided for in the leak circuit.

2. The fact that the interconnecting feature, as originally worked out for street-railway work, would not operate with equal efficiency in both directions, and, therefore, though fairly satisfactory for street-car work, would not at all fulfill the requirements of trunk-line work; this led to its further consideration, with consequent result of a circuit arrangement affording equally effective operation in either direction.

3. The fact that when a motor attained a speed, which caused its counter-electro-motive force to approximate closely the direct electro-motive force of the line, the current passing would be so diminished in volume as to be insufficient to keep the switch magnets closed, thus producing an uncertain action, with consequently dangerous fluctuations; this led to a consideration of ways and means to insure a fixed *minimum* current through the switch magnet, independent of and indifferent to the quantity of current taken by the motor. The means finally introduced to effect this object proved upon trial to be positive and reliable in operation; without this provision, heavy traffic lines can not be operated by a sectional-conductor system.

The diagram, Fig. 7, illustrating the leak circuit will also *clearly* show the "by path" feature. Upon examination of this diagram, it will be noticed that the current for the motors flows from the positive main through the switch contacts to a sectional conductor and contact shoe through the motors and to the controller, where it divides itself, one part of the current flowing, by way of the negative contact shoe and sectional rail, to and through the switch coils, and finally to the rails or the return conductor, the other part flowing through a storage battery of low voltage—charging the same—to the car-wheels and to the return conductor. It will thus be apparent that, should the current through the motors diminish to any great extent, the current through the battery connection will reverse, and the battery will supply the additional current needed to safely work the electro-magnetic switches.

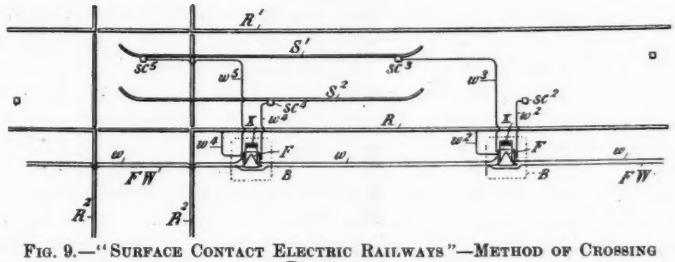

FIG. 9.—"SURFACE CONTACT ELECTRIC RAILWAYS"—METHOD OF CROSSING PROTECTION.

Among the many and sometimes captious criticisms which our work has met with during the period of its development was one condemnatory of the use of a storage battery of material electro-motive force and current capacity, and consequent cost and weight. We employed such a battery at the outset for the dual purpose of operating the magnetic switches and propelling the car over short distances, by the latter function obviating the necessity of electrically equipping crosses, switches, turnouts and other situations, otherwise involving not only expensive construction but great liability to interruptions consequent upon the possible short-circuiting of the conductors at such places. Although we presently gave ear to this criticism as one involving a prejudice not readily combated, we, nevertheless, adhere to the opinion that such combination of battery and direct supply will yet be found to be an exceptionally economical and practical system of street-car propulsion. However, having decided to concede the objection to be one deserving of our attention we sought and found the means of dispensing with the battery, and, at the same time, overcoming the liability to interruptions in the event of short circuits. The means discovered for accomplishing this may be expressed in the paradoxical statement that, though a short circuit may occur and the safety fuse be blown, the current will yet flow in sufficient quantity to propel the car off the impaired section and permit its continuing progress without so much as an actual stoppage.

Such a provision is imperative in any surface contact system, since in any such system it is impossible to so differentiate the plans in which the positive and negative conductors lie as to render accidental short circuits improbable.

To illustrate this feature, reference is made to Fig. 9 where $S'S^2$ represent the trolley shows which are connected to the motor on board of the car (not shown), RR' represent the tramrails of one line of rails and R^2R^2 corresponding lines of rails of a crossing tramway. SC^2, SC^4, etc., represent one line of sectional trolley conductors or contacts, and SC^3, SC^5, etc., represent the parallel line of sectional trolley conductors or contacts. BB represent two of the switch boxes, the circuit connections from the current feeder or main thereto and therefrom to the sectional trolley conductors being identically like those described in the previous diagrams.

F represents the fuse in the switch box, which is designed to "blow" for such current as may be deemed best, and X represents a resistance in a shunt or derived circuit about the binding post to which the opposite ends of the fuses are connected, the arrangement being such that when any short circuit occurs between either of the trolley shows, as S', one of the sectional trolley conductors

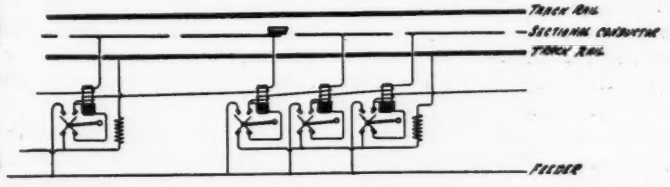

FIG. 10.—"SURFACE CONTACT ELECTRIC RAILWAYS"—THE JOHNSON-LUNDELL SYSTEM OF 1894.

SC^5 and one of the crossing lines of rails, as R^2, the fuse will be blown, but the circuit between the circuit connections in the switch box and that particular sectional trolley conductor or contact will not wholly be ruptured, and the sectional trolley conductor, when connected through the circuit connections in the switch box, will still carry sufficient current to move the car over the crossing to the next sectional trolley conductor in advance.

(To be continued.)

SOME INTERESTING FACTS ABOUT PARA RUBBER.

HOW THE SAP IS GATHERED AND PREPARED.

It is reported that, judging from the present outlook, this year's crop of Para rubber will probably be much larger than that of last year. It is estimated that a new rubber-producing area in the Amazon section, recently discovered and as yet untouched, is many times larger than that now being worked. Consular reports show that there entered the port of Para, during the fiscal year 1897-98, 22,257 tons of rubber, and of this amount 11,422 tons were shipped to the United States and 10,796 tons to Europe. The state of Para does not produce more than two-thirds of the rubber shipped from the port of that name, the balance coming from the states of Amazonas, Peru, Bolivia, etc.

The rubber tree in appearance resembles the English ash more than anything else, and grows to a height of upwards of 60 feet. The leaves are trifoliate The localities where rubber trees thrive the best are on islands and low ground near the rivers, where the banks are periodically inundated. Ground that is above water at all times, or that has no drainage, is not suitable. The peculiarity of this rubber tree, the "hevea," is that it will not grow satisfactorily on cleared or open ground. It requires the shade of other trees and still air from the time its growth begins until it becomes an adult tree. Without these conditions, the supply of milk or sap is very much affected. The "hevea" requires about 15 years to mature.

The area that is known to produce Para rubber amounts to, at least, 1,500,000 square miles. It is believed that further exploration will show that this area is underestimated. On the river Acre, one of the tributaries of the river Purus, 200 trees yield as much as three tons of rubber a year. Great quantities of "hevea" are known to exist on the banks of the Japura, but that territory has not yet been opened up.

It was at one time imagined that the excellence of Para rubber was largely due to the kind of fuel used in curing it. In the Amazon region the fuel used in a clay funnel consists generally of the nuts of certain palms. The reason these nuts are selected is because they emit a continuous dense smoke and are more portable than other obtainable fuel. The palms that furnish the fuel were at one time transplanted in Africa, with a view to making Para rubber there. The experiment, however, has not been successful. When none of the palms is accessible bark and twigs are used as fuel.

All workmen in the forest carry a wood knife, the blade of which is about 26 inches long and two inches broad. One of its principal uses is to cut the fuel for the preparation of rubber. Owing to the damp climate, the blades are electroplated to prevent their becoming rusty before they are marketed. The knives, which resemble the Cuban machete, are all imported from the United States. The rubber collector carries a small axe to chip a smooth surface on the bark preparatory to attaching a cup to the tree. The handling of the axe requires great skill in order not to injure the bark. A smooth surface is made to prevent impurities mixing with the sap. The cups are clay or tin. The former are attached to the bark by means of a little clay. Their weight, however, makes them inconvenient to carry when the trees to be tapped are far apart. The collector then prefers to carry tin cups. They easily penetrate the bark by means of the sharp edges and hold to the tree without the use of clay. The use of the tin cup, however, is said to be injurious to the tree, to some extent.

Part of the collector's outfit consists of a light gourd—large enough to carry the contents of from 500 to 700 cups. A clay bowl is next required, in order to receive the contents of the gourd. It is of sufficient size to contain the product of several days' work before it is cured. The calabash tree provides calabashes, which are employed to ladle the milk from the clay bowl into the mold. A broad-bladed wooden paddle is used as a mold, and is made locally. This completes the outfit for the rubber collector. All these articles are made locally, with the exception of the knives. The axes and the tin cups are manufactured in the towns and villages of the Amazon region.

The collector has to use his knife to cut his way through the undergrowth, and also to cut down a sapling occasionally to bridge a rivulet. At times he is knee-deep in ooze or up to his waist in water. On arrival at a rubber-tree, he chips away the rough parts of the bark, makes a more or less smooth surface, attaches a cup, and makes a small gash above for the sap to fall into the cup, and repeats this process in a line round the tree until he has attached six or seven cups. Then he proceeds to the next tree and does the same. He continues this process until he has tapped from 75 to 150 trees, which can be done in a day if they are not too far apart. On the following days the gashes in the trees are made a trifle lower down than the first ones. Some collectors tap the trees in the morning and return to collect the sap in the evening, whereas others tap in the evening and collect in the morning. An expert gathers seven pounds daily in the Lower Amazon; in the Upper Amazon three times this amount is collected.

When the accumulation of rubber is sufficient—usually in three or four days—the collector lights a fire in the hut he has erected, places the funnel over a fire, pours a thin coat of milk over the paddle and holds it over the smoke to coagulate. The process is repeated until a large cake has been formed. To release the paddle from the cake, it is necessary to make a slit on one side. The paddle mold makes a cake of uniform and even shape, and is in general use in the state of Para. In other parts, a spit is placed on two upright forked sticks and given a rotary motion. By this means the rubber is cured with greater ease. Paddle smoked rubber is decidedly preferred, as it is drier and seemingly more carefully cured.

Many attempts have been made to introduce improved curing apparatus. Up to this writing, however, they have not been received with popular favor, because the common method, although very primitive, possesses the advantages of being simple and inexpensive. The process of curing rubber is extremely injurious to the eyes. Many cases of total blindness result therefrom.

There are three grades of Para rubber; viz., fine, medium and coarse. If rubber is not uniform and contains impurities, it is classified as medium. The coarse quality, or "Sernamby," consists of scraps that have not been cured.

Insufficient labor is the most serious difficulty in the rubber industry. It would scarcely seem advisable to invest money in rubber estates, unless the owner first can see his way clear to obtain sufficient labor with which to collect the rubber. In reality, the genuine owner of the produce of the forest is the collector, not the landowner.

As a rule, the landowner makes advances to the collectors for their outfit, food, etc., and in return receives the rubber collected by them. He sells the produce on the collector's account, retaining 20 per cent for himself, and continues making advances in such manner that the collector always remains in his debt and consequently in his service. It frequently happens, however, that the collector takes the advance and fraudulently disposes of the rubber to any buyer who may be on hand. A great deal of leakage occurs in this way, and I believe no method of preventing it has been discovered. This is another of the difficulties of the landed proprietor. One of the methods in practice is to lease the trees in lots of 75, 150 or 200 at a given sum per annum, and to stipulate that the lessee should sell the rubber and purchase all his supplies from the owner. The lessee works his lot to the utmost, and usually earns a handsome profit after paying the rent, and, although the owner does not obtain the full value of the lots rented, he makes up for it by charging commission on goods supplied, etc.

The profits of the rubber industry would seem to be large, because the employer keeps 20 per cent and makes about the same on the goods supplied the employés; but it must be considered that out of 100 employés, whose outfit and traveling expenses have been advanced, at least 75 die, desert, or return to their homes on account of illness. The expense incurred for them is accordingly a dead loss, and when this is deducted from the total income the profit is greatly reduced.

The "aviador" is a person who advances supplies and capital to the rubber collector in exchange for rubber. The principal "aviador" resides at the chief centers, and finances a number of small "aviadores," who travel about in the rubber industries. The exporters of rubber are mostly agents of United States and British importers. They buy from the "aviadores" in the principal centers.

A Telephone Conversation Over a 1,90-oMile Circuit.

A press dispatch from Little Rock, Ark., says that an extraordinary long-distance telephone test has been made there by Charles J. Glidden, president of the Southwestern Telegraph and Telephone Company. Mr. Glidden held a distinct and clear conversation over the wire with Frederick A. Farrar, of the firm of Poor & Greenough, Boston. The distance from Little Rock is 1,900 miles. Mr. Glidden says this is the longest circuit in the world. Satisfactory tests were also made with Memphis, Chicago, Minneapolis, Dallas and Galveston.

ELECTRIC LIGHT FLASHES.

The Worthington, Ind., Light and Power Company has increased its capital stock from $5,000 to $9,500.

The Oconto, Wis., Electric Light Company's plant has been destroyed by fire, at a loss of $60,000; insured for $18,000.

The city authorities of Cleveland, Ohio, are said to be preparing ordinances ordering all overhead wires under ground.

The Clinton, Ky., Water and Light Company is considering the question of putting in a plant to light the town of Clinton with electricity.

Messrs. Frank Adams and D. J. Hauss, of Cincinnati, were recently in Richmond, Ky., negotiating with the Richmond City Council for the privilege of putting in an electric light plant.

Upper Sandusky, Ohio, has contracted with the Citizens' Electric Light and Power Company to light the streets at the rate of $75 per light per annum. The lights are to burn until 3 A. M.

The Central Railroad of New Jersey's electric light plant in Bayonne, N. J., has been wrecked by fire which originated in the oil room. The dynamo of the plant was totally ruined. The loss is estimated at $5,000.

C. E. Estabrook has sold the South Milwaukee, Wis., Electric Light and Power Plant to a company known as the South Milwaukee Electric Light and Power Company for $20,000. The new owners will operate the plant and lease the light and power.

J. M. Riley, of Bracken County, Ky., and W. E. Arnold, of Dayton, Ohio, have made arrangements to start a large flour mill, and probably an electric light plant, at Owenton, Ky. The business men of the town have donated a site.

The Eldora Resort and Power Company, Denver, Colo., has been incorporated, with a capital stock of $100,000. The company will assume control of the Peterson Lake property, in Boulder County, and convert it into a Summer and pleasure resort.

The Somerset Lighting Company, of Somerville, N. J., has just closed contract with the United Gas Improvement Company, of Philadelphia, for installation of a modern gas plant, including a new 50,000-foot gasholder, and between six and eight miles of new street mains. This company already has a modern electric light plant, and these improvements will make it a complete and thoroughly up-to-date lighting plant.

The Edison Electric Illuminating Company of Easton, Pa., are preparing to extend their plant, and will probably use water power from the Lehigh River, which is situated adjacent to their station property, as an auxiliary to their present steam plant. They are also further considering the purchase of a direct-connected unit of 400 horse-power. This plant has always been able to produce current at a very low cost, but they believe by further improvements they can yet reduce the cost. Mr. Albert B. Herrick, their consulting electrical engineer, is preparing the plans for these improvements.

In his annual report, United States Consul Roosevelt, of Brussels, Belgium, says: "The employment of electricity for illuminating purposes is rapidly extending in this city. The lamps, as well as nearly all other electrical supplies here, are of German origin; Holland supplies a few and England a fair percentage of the electrical wires employed. American lamps and other electrical goods are exposed for sale on this market, and are conceded to be superior to those imported from Germany, France and England, and with proper effort the trade in this line could be greatly increased. Especially in copper wire, insulated wire, large cables, and arc lamps, is there an excellent opening.

It is expected that the consolidation of the three electric light companies of Baltimore will be consummated by the first of the year. The preliminaries have been completed, and the Consolidated Electric Light Company, which is the name of the corporation which has been formed to take over the Brush Electric Light Company, the Edison Electric Light Company and the Northern Electric Light Company, has engaged Col. John A. Tompkins to conduct the financial examination of the companies, and Messrs. Steele, Semmes, Carey & Bond and ex-Judge William A. Fisher to pass upon their legal status. Actual consolidation is contingent upon their report. The syndicate which the Baltimore Trust and Guarantee Company agreed to form, for the purpose of underwriting the $4,000,000, has been oversubscribed. Baltimore capitalists will furnish about $1,000,000 and Philadelphia about $3,000,000 of the amount. The new company will also issue $5,000,000 of common stock, which has already been practically sold. Only about $4,300,000 of the stock will be paid in at the start. The new company will have $450,000 in cash, which will be used in improvements.

Telephone News .....and Comment

The Automatic Telephone Company, of New Bedford, Mass., has been incorporated, with a capital of $100,000, for conducting a telephone business in the city of New Bedford. President, John Macomber; treasurer, Fred Taber.

The Southwestern Telephone and Telegraph Company has purchased ground at Waco, Tex., on which a new telephone building will be erected at once. A first-class equipment will be installed and all wires will be placed under ground.

A company in which Armour, Swift and Nelson Morris are interested has been incorporated to build and operate an independent telegraph and telephone line to connect all their packing houses in the West with their Chicago houses. The proposed line is to connect East St Louis, Omaha, Sioux City, St. Joseph and Kansas City. The system, it is said, is to be constructed of copper on 40 foot poles, and will have five wires, so that at least five of the big packers at the yards may have a private wire for telegraph or telephone.

The statement of the American Bell Telephone Company for the month ended November 20 shows:

	1898.	1897.	Increase.
Gross output	35,159	29,023	6,136
Returned	15,486	7,817	7,669
Net output	19,673	21,206	1,533
Since December 20:			
Gross output	313,522	214,897	98,625
Returned	135,568	84,068	51,500
Net output	177,954	130,829	47,125
Total outstanding	1,097,475	904,678	192,797

The Bell telephone instrument statement for the month ended November 20 breaks another record so far as the gross output of instruments is concerned; namely, 35,159, but, owing to the large number of returned instruments, the net output shows a decrease of 1,533 instruments compared with last year.

The Slate Belt Telephone and Telegraph Company, of Nazareth, Pa., inform the ELECTRICAL REVIEW that they have commenced reconstructing their line for metallic circuits. Over $10,000 will be spent on construction and improvements. New metallic switchboards will be placed in the following exchanges: Nazareth, Bangor, Pen Argyl and Wind Gap, Pa. The officers of the company are C. Miller, president; John A. Miller, vice-president; Leslie C. Williams, treasurer, and J. J. Heintzelman, secretary.

The telephone exchange proprietors of Missouri have organized the Missouri Independent Telephone Association. Thirty exchanges were represented at their first meeting. J. A. Hudson, of Columbia, was chosen temporary chairman, and E. W. Henry, of Glasgow, was made temporary secretary. A committee, consisting of the chairman and secretary and Theodore Gary, of Macon, E. D. Graham, of Mexico, and D. F. Vincent, of Slater, was appointed to report a form of constitution and by-laws at the next meeting, to be held in St. Louis, December 27.

New York Postal Telegraph Building Escapes a Fire.

A serious fire last Sunday evening gutted the building at Warren street and Broadway, New York city, spread to the Home Life Insurance Building adjoining on the south and stopped at the Postal Telegraph-Cable Company's Building, immediately adjoining the latter. While a few window frames and panes of glass in the Postal Building were injured, no serious damage was sustained in the company's operating room near the top of the building. The reports that the company's service was stopped on account of the fire, the ELECTRICAL REVIEW is informed, are untrue. Some of the night operators knocked off work for a little while, but soon went back to their keys.

Carbon Company in Receiver's Hands.

A receiver was appointed last week for the New York Carbon Works, of Rahway, N. J.

NEWS OF THE TRADE.

The Boston offices of the Fort Wayne Electric Corporation have been removed to the sixth floor of the Equitable Building, on Milk street.

The firm of W. G. Nagil & Company has been organized for the purpose of conducting a general business in electrical machinery, supplies and construction, in Toledo, Ohio.

The Electric Appliance Company, Chicago, report that they are meeting with splendid success with the '98 model Packard transformer, and that it is more than fulfilling all the claims and guarantees that they have made.

The Berlin Iron Bridge Company, of East Berlin, Ct., are erecting for the town of Whitehall, Washington County, N. Y., a riveted girder bridge, having a span of about 70 feet. The bridge is of latticed girder type, with steel floor beams, and of a design to carry, besides ordinary traffic, the weight of a steel road roller.

The Western Electric Supply Company, of St. Louis, announce that they have completed arrangements with the Moloney Electric Company, of that city, whereby in future the product of the latter company will be handled by them in the South and Southwest. They say also that the "Moloney" transformers will always maintain their high standard, and that the utmost confidence may be placed in them. These transformers are now made for the following service: Series, arc and incandescent lighting, testing, "step up" and "step down."

The Allman Gas and Gasoline Engine.

The Allman gas and gasoline engine was patented and placed on the market about 10 years ago by Mr. I. F. Allman, of New York city. The business thus established has recently passed into the hands of the Allman Gas Engine and Machine Company, with offices and factory at 430 Washington street, New York city. The officers of the company are George P. Lawson, president; C. A. Calleson, vice-president, and Albert McDougal, secretary and treasurer. This company owns the original and other patents on the Allman engine and is building up a very desirable trade among small power users. The illustrations herewith show the horizontal and vertical types of this engine.

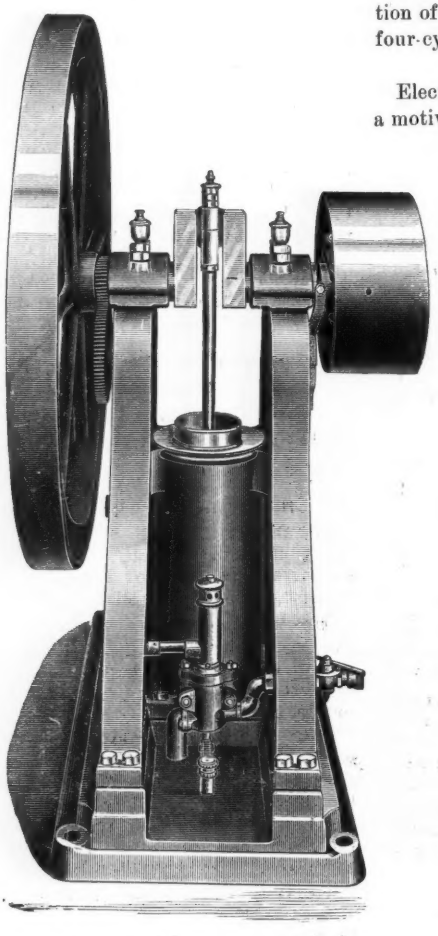

FIG. 1.—UPRIGHT TYPE OF THE ALLMAN GAS AND GASOLINE ENGINE.

The Allman gas and gasoline engine is unusually simple in its construction and is easily operated and repaired. As has already been stated, either gas or gasoline can be used for fuel. The manufacturers have found that the use of gasoline for fuel results very satisfactorily. Up to two years ago the Allman engines were used chiefly by confectioners, butchers, milkmen, etc., but lately the engine has been introduced in the electrical field for use with small isolated lighting plants. The company is also building a marine type of engine for use with boats requiring engines from three to 20 horse-power.

The upright engines comprise a full line up to six horse-power and the horizontal type is made in all sizes from one to 25 horse-power. The manufacturers have never varied from the rules laid down for the construction of the best type of the modern four-cycle engine.

Electricity is to supplant steam as a motive power on another excursion line in western New York. It is announced that the Rochester & Irondequoit Road, running between Rochester and Lake Ontario, will be equipped with electricity. At first it was thought that the steam line on the east side of the Genesee could be operated at less expense than the electric-equipped one, but evidently the past Summer season's returns did not prove it. The Rochester & Irondequoit Road, better known as the Bay Railroad, will be run with electricity next year.

At the annual meeting of the directors of the Anacostia, D. C., Street Railway Company, Mr. F. C. Stevens was elected president in place of Mr. H. A. Griswold, resigned, and the following directors were named: F. C. Stevens, H. D. Mirick, Oscar T. Crosby, C. A. Lieb, Mr. Griswold and Mr. Minor.

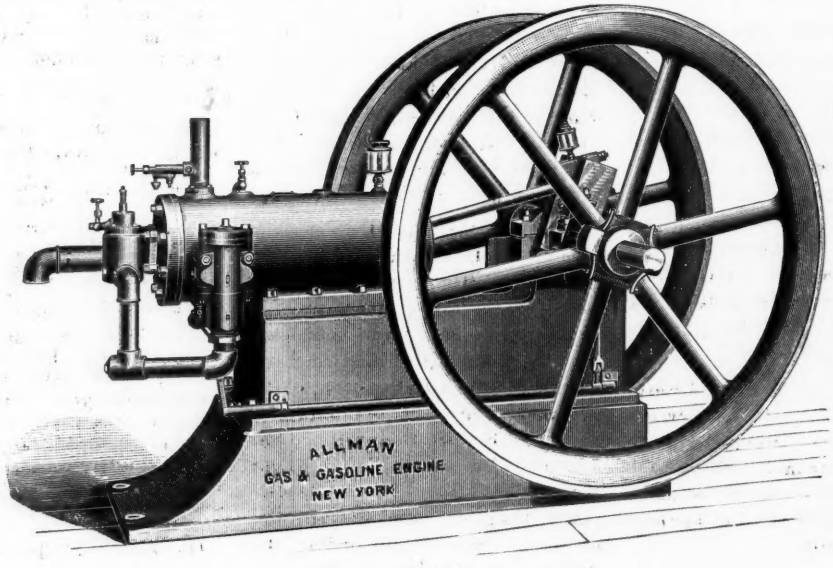

FIG. 2.—HORIZONTAL TYPE OF THE ALLMAN GAS AND GASOLINE ENGINE.

Some Specialties of the Ohio Electric Works.

The Ohio Electric Works, of Cleveland, Ohio, are manufacturers of numerous electrical specialties, two of which are illustrated herewith. In Fig. 1 is shown a hanging lamp of

FIG. 1.—OHIO ELECTRIC WORKS' HANGING LAMP.

14 candle-power, current for which is supplied by eight Fuller batteries. The device is so arranged that practically no trouble is likely to occur, and any one without experience can install and use it. The light produced is a clear and powerful one, and the apparatus, as a whole, is well designed for use at the desk, in the library, dining-room, etc. The complete outfit is sold at a very reasonable price, and consists of the lamp, reflector, key-socket, conductor-cord, eight Fuller batteries, wires and all the necessary requisites.

In Fig. 2 is shown a carriage light made by the Ohio Electric Works. It is supplied in a neat case, in which eight or 10 improved dry cells are arranged in series multiple, which secures long life and obviates all charging. The parabola reflector magnifies the three candle-power lamp eight times, causing it to throw its rays 200 feet. It is claimed that the lamp consumes only one-half watt to the candle-power. These outfits are supplied arranged for use, and can be at once attached to any vehicle.

Besides the two specialties illustrated and described herewith, the Ohio Electric Works manufactures and has for sale a number of electrical specialties which are fully described in circulars, which may be obtained free by any one applying for them.

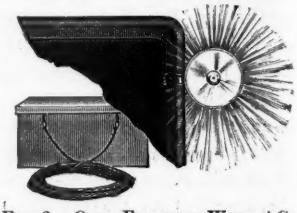

FIG. 2.—OHIO ELECTRIC WORKS' CARRIAGE LAMP.

Wire Fence Telephones in Australia.

Telephonic communication has been established between a number of farms in Australia by means of wire fences. The *Australian Agriculturist* publishes a note from a correspondent writing from a station near Cobar, stating that it was easy to converse with friends at a station eight miles distant with instruments connected on the wire fences, and the same kind of communication was established over a distance of 13 miles.

An Ohio Electric Road to be Sold.

Judge Wm. H. Taft has ordered the foreclosure of the mortgage of the Zanesville, Ohio, Street Railway and Electric Company. The mortgages are for $170,000 and $125,000 and the sale will take place January 3.

The Genius of Destruction.

[*Translated from "L'Événément."*]

Man is born a vandal. His instinctive joy, his first pleasure is to destroy. From the reminiscences of his primitive savagery, throughout the process of civilization, this barbarous atavism which incites him to destruction and strife adheres to him. War, apart from the sacred causes which arise from the right of legitimate defense, is often nothing else than a manifestation of this instinct. It seems that Man, in imitation of Nature, and even oftener than Nature, offers an example, wants to create cataclysms in obeyance to this fatal heredity. His very genius provokes or produces them; for, since it is a question of catastrophes, the ambition of his knowledge knows no limits, and, devoured by the spirit of Evil, he perfects his engines of disaster and ruin.

Thus Nikola Tesla, a learned American, a rival of the illustrious Edison, has just made a discovery which, when applied to the art of warfare on sea or land, is to furnish to the armies a power of destruction so formidable that one scarcely dares to contemplate its practical results. The secret of this discovery resides in the transmission of electrical energy to distances which, until now, nobody could surmise. By simple atmospheric conduction, and without any wire whatever, the current is to traverse thousands of kilometers, bring mourning and desolation and carry death, silently, invisibly, into the ranks of the enemy, who will not even be aware of the approach of the Camarde and able to defend himself against its unforeseen blow.

It is with such exploits that human wisdom taxes its ingenuity, and one still dares to praise the moral effect of philosophy.

According to Nikola Tesla, the problem solved by him consists in producing and projecting currents of an enormous voltage heretofore unknown to electricians.

By means of this discovery an operator may, in the shelter of his laboratory, his person not exposed to the least danger, in perfect security blow up out at sea boats carrying explosives at incalculable distances and beyond the range of the most powerful guns.

A simple unarmored, unprotected vessel, having not even a cannon on board, but capable of great speed, may become the most terrible adversary of a whole fleet. A single operator in command of a flotilla of small boats, the evolutions of which are controlled by him with mathematic precision, may destroy the enemy's squadrons without having himself run any risk. In the same manner, and with as little danger, he may send into the enemy's port explosives which would produce a disaster similar to an earthquake.

In order to cause the credit to be given to such prophecies to be appreciated, the learned Yankee has constructed a small model of a boat which performs all the evolutions of his prescription. It is terrible in its precision. An electric motor placed at a distance, in another room, controls all its movements automatically and in a reliable manner. And in this way an electrician on board of a flagship seeming quite inoffensive may, with a simplicity which would eclipse the knowledge of the most profound strategists, direct against the enemy small vessels intended to spread death around themselves—death which nobody suspects, which calls unawares and from afar, with the prophetic surprise of a cataclysm prepared by man.

This is terrible, and causes one to shudder when contemplating this power of destruction brought to the height of its terror.

We must not be incredulous, however. Nikola Tesla proposes to instruct the most intellectual and skeptical people on earth. He intends to exhibit at the exposition in 1900 a torpedo of his invention. He will himself direct its movements from New York, without a conducting wire, by simple electric transmission through the high regions of the atmosphere.

And when we have been entertained what will be the result for humanity, thus threatened with the worst catastrophes, at the mercy of an infernal operator endowed with fiendish, almost diabolical power?

The man who could make this discovery knows how to reassure us in this regard. Like all inventors of destructive machines, he claims that his instrument will make the governments which are inclined to create international conflagrations hesitate. The power of destruction of which he disposes is, he says, so unlimited and its employment in war would endow an army with such an instrument of victory, that no country being concerned about the lives of human beings would dare to assume before civilization, before history, the terrible responsibility of a scientific war. On this account Nikola Tesla claims a right to be called a benefactor of humanity.

Posterity will, perhaps, accord him this claim, as well as to others who have, like him, perfected the art of destroying in bulk and at wholesale, dreaming of such numbers of deaths that nobody would want to boast the tragic glory of ever having caused them.

The genius of destruction would seem to have, then, two aims. It creates evil, but mostly good. Through its help the abolition of wars may no longer be a utopia of generous dreamers, an empty dream of enlightened, altruistic thinkers who have compassion with their fellowmen. A blessed era will open up to the people, whose quarrels will be settled in view of the terror of the cataclysms promised by science, views radiant with peace, which has at last conquered over centuries of barbarism, and there will be definite harmony in the entirely pacified universe!

What contradictions of conception is the human mind subject to? At the moment when, thanks to the magnanimous initiative of Czar Nicholas II, the problem of universal disarmament is attracting the attention, the solicitude, of the diplomats of all nations, an inventor, a physicist of the New World, promises us the end of the barbarous international duels by the tragical horror of the work of Death, by an unheard-of improvement in the processes of destruction.

Will the universal peace result, then, from the excess of evil, or from the moral philosophy which springs out of modern civilization? Who can predict it to a certainty?

What does it matter, after all, whether we owe it to the former or the latter, if only some day this sublime utopian dream, this dawn of new times announced by the prophets of humanity, will realize, perhaps, at the beginning of the century which is about to be born. MARCEL HUART.

Paris, November 12.

FIGS. 1 AND 2.—A MAGNETIC INCANDESCENT LAMP HOLDER.

A Magnetic Holder for Incandescent Lamps.

The combination herewith illustrated, consisting of an electro-magnet fitted for the socket of an incandescent lamp, is of value particularly for machine shops. The magnet is of sufficient strength so that it may be placed against a piece of iron, holding the lamp in any position. The poles of the magnet may be seen at the end of the socket. The cores through which the magnet is energized are within the base; the lamp current supplies the energy as it passes through these coils on the way to the filament. This results in developing a strong magnet which readily adheres to the inside of a boiler, the interior of a ship or any dark corner where any iron surface is exposed. It is not necessary to have a lamp especially designed for use with the holder. Any socket may be inserted in the magnetic holder. The device is manufactured by Jenkins Brothers, 71 John street, New York.

LITERARY.

Three notable serials begin in the December number of *McClure's Magazine*. "Stalky," the first of Rudyard Kipling's series of stories of English school-boy life, is as hearty and wholesome a tale of school-boy ingenuity and adventure as one could wish to read, and, while complete in itself, leaves the appetite keen for more of the same sort. The first of Miss Tarbell's articles on the "Later Life of Lincoln" is an even more distinguished beginning than the first of Mr. Kipling's stories. Lincoln appears in the full sanity and tenderness of his superb character, in her account of his actions, utterances and bearing during the perplexing period between his first election and his first inauguration as President. Finally, we have the first of a series of papers by Captain Mahan on "The War on the Sea and Its Lessons"—a contribution to the literature of the recent war that, coming from a member of the Strategy Board and the highest authority on the science of naval warfare, can not fail to be read with eagerness in all parts of the civilized world.

The stockholders of the Peoples Electric Railway, of Sandusky, Ohio, have elected the following directors: George H. DeWitt, George Feick, C. L. DeWitt, William H. Gilcher, Jacob Kuebeler, Daniel Kunz, A. W. Prout, Frank Stang, T. B. Taylor, John Geideman, Thomas Wood.

ADVANCE INFORMATION

New Incorporations.

JERSEY CITY, N. J.—The Cooke Electric Match Company has been incorporated, to manufacture lighting devices; capital, $50,000; incorporators, George W. Sandford, 29 Linden place, Orange, N. J.; Emma M. Cooke, Jersey City, N. J.; Edward Sandford, South Orange, N. J.

CHARLESTON, W. VA.—The American and Indies Company has been organized, for the purpose of owning and operating railroads, tramways, steamships, telegraph and telephone plants, and carrying on a general financial bond and security business. F. R. Herner, J. F. Ritter, W. C. Avery, A. S. Johnson and R. W. Duffy, all of Washington, D. C., incorporators.

NEW YORK, N. Y.—The Ball Induction Ore Separating Company has been incorporated, for the purpose of buying, selling, owning and controlling letters-patent on mechanical, electrical and chemical devices for gold and silver mining; capital subscribed, $1,500, with the privilege of increasing to $5,000,000. Edgar M. Hoagland, Otis S. Sage, Clinton M. Ball, James Sheldon, Jr., and Willis S. Merriam, all of New York city, incorporators.

Electric Light and Power.

HARRISBURG, PA.—John E. Graybill, electrician, has received the contract for placing a complete electric lighting plant, with a capacity of 100 incandescent and 10 arc lamps, in the Harrisburg Pipe-Bending Works.

NEW YORK, N. Y.—The American Sun Light Company has been incorporated; capital stock, $10,000; directors, John L Nisbet, of Yonkers; R. H. Jaeger and R. H. Stearn, of New York city.

FARGO, N. D.—The new electric light and power plant at this place is completed and in working order.

ROYAL OAK, MICH.—Royal Oak is considering the matter of lighting the village by electricity. William Hilzinger, of this place, is interested.

SOMERVILLE, TENN.—W. D. Scruggs may be addressed concerning erection of proposed electric light plant.

WOODSFIELD, OHIO—A municipal power plant is to be put in at this place. For information address W. H. Pelton, Room 806, Cuyahoga Building, Cleveland, Ohio. Will be open for bids December 27, 1898.

ELMIRA, N. Y.—The Elmira Light, Heat and Power Company has been incorporated; capital, $10,000; directors, James B. Rathbone, of this place, and four others.

FREDERICKSBURG, VA.—City Clerk may give information concerning proposed erection of an electric light plant.

GAINESVILLE, GA.—James P. Edwards, of Augusta, Ga., contemplates the construction of an electric light plant in this place.

CLARENCE, MO.—H. J. Williams, Mayor, may be addressed concerning establishment of a $5,000 electric light plant.

EWAN, N. J.—City Clerk may be addressed concerning contemplated electric light plant.

RED LAKE, MINN.—The Red Lake Electric Light Company has been incorporated by Marcus Johnson, Emma F. Marshall and Luman C. Stone; capital stock, $8,000.

New Electric Railways.

CARROLLTON, KY.—Incorporation papers have been filed for the purpose of building an electric line from Warsaw to Milton and from this place to English Station; capital stock is $50,000. The company will also build a bridge across the Kentucky River at this place. The officers named are Myron O. Baxter, president; James M. Gaumt, vice-president; Martin L. Downs, secretary; James S. Jett, treasurer.

DELAWARE, OHIO—An electric railway will soon be constructed between Marysville and this place, and will be known as the Marysville, Pharisburg, Richwood, Magnetic Springs & Delaware Electric Railway Company.

GREENFIELD, IND.—The County Commissioners have granted William C. Dudding and F. G. Banker, of this city, a franchise to construct and operate an electric railway on highways throughout the county. The promoters of the enterprise contemplate running a line from Anderson to Indianapolis by way of this place.

NEEDHAM, MASS.—The Selectmen have granted a franchise to the Needham & Boston Street Railway Company from this place to the Dedham line by way of Great Plain and Dedham avenue, Harris street, and thence to the Dedham line at Needham street. The road is to be completed by June 1.

KANSAS CITY, MO.—There is again talk of building an electric line from this place to Liberty and Excelsior Springs Charles L. Dougherty, of Liberty, and Charles L. Leitch, County Surveyor of Clay County, are interested.

New Telephone and Telegraph Companies.

ALBANY, N. Y.—The New Rochelle & Westchester Telephone Company has been incorporated, to operate in New York, Massachusetts, Connecticut and Rhode Island; capital, $150,000; directors, Heinrich Mayer, New York; H. A. Connor and F. R. Kellogg, Brooklyn, and others.

ALBANY, N. Y.—The Rocket River Telephone Company has been incorporated, to operate a line in Potsdam and to the villages of Canton and Norwood; capital, $6,000; directors, J. A. Crawford and M. S. Crawford, of Hamden, and Fred C. Ward, Delhi.

PORTSMOUTH, OHIO—Work will begin at once on a telephone exchange in this city; $15,000 is the estimated cost of it, and it is to be in readiness by February 1.

BAD AXE, MICH.—The new telephone line between this place and Sand Beach is completed.

PLYMOUTH, OHIO—The Norwalk Telephone Company has just secured a franchise at this place, and will build an independent exchange here.

DOYLESTOWN, PA.—The Standard Telephone Company has been granted franchises in this place.

ONSTED, MICH.—A telephone line is to be constructed from near Wolf Creek to this place, connecting with a number of farmhouses on the way.

LIVONIA STATION, N. Y.—Arrangements are nearly completed by which the Bell Telephone Company, of Buffalo, will extend their lines from this place to Springwater.

ROCHESTER, N. Y.—The city will build a new telephone line to Hemlock Lake, as the old line is practically useless.

CHARLOTTE, N. C.—The Queen City Telephone Company has been organized, with J. A. Helvin, president; A. G. Brenizer, treasurer.

GRAND RAPIDS, MICH.—Fuller & Perkins are organizing a stock company to establish a complete telephone exchange to cover Mason, Oceana and Manistee counties.

PADUCAH, KY.—Henry Biederman, who recently obtained telephone franchise, is organizing a company to install system.

WILKES BARRE, PA.—The North and West Branch Telephone Company, of which Congressman M. H. Kulp is president, has decided to construct a line connecting Williamsport, Montgomery and Montoursville with the local line The contract has been awarded to W. D. Bernard, of the East Telephone Construction Company; work to be commenced within 30 days.

LUBEC, ME.—The Lubec Telephone Company has sold out its lines and rights to the New England Telephone Company, who will place a long-distance instrument in each building now supplied with the local wires.

RICHVIEW, ILL.—The Central Union Long-Distance Telephone Company has just completed a line from Centralia to Ashley, Ill., giving Centralia, Irvington, Richview and Ashley a direct line to St. Louis.

TOLEDO, IOWA—The Commercial Telephone Company, operating exchanges here and at Tama, and having toll-lines to Crystal and Traer, with stations at several farmhouses, has sold out to W. D. Spayth & Company. The officers of the new concern are W. D. Spayth, general manager; W. H. Withington, president; H. C. Shanklin, treasurer; E. M. Spayth, secretary; W. H. Withington, A. G. Smith, W. D. Spayth, J. G. Bull and J. R. Caldwell, directors.

NASHVILLE, IND.—The Indianapolis Long-Distance Telephone Company has contracted to extend its line to this place. The first company to penetrate the wilds of Brown County.

BELLEPLAIN, N. J.—A new telephone line has been established between this place, Eldora and Tuckahoe.

CEDARVILLE, N. Y.—The Cedarville & Litchfield telephone line has been completed and in good working order.

MEMPHIS, TENN.—The Cumberland Telephone and Telegraph Company will build a structure for offices and exchange headquarters.

CHRISTIANBURG, VA.—Aaron Graham proposes the construction of a telephone line to Roanoke.

. . THE . .
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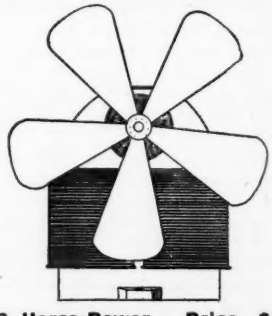

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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Build. ing, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 29, 1898.

614,839 Method of forming electrical connections; W. B. Cleveland, Cleveland, Ohio—The method of joining two members of copper to form an electrical connection, consisting of, first, casting one member upon the other, heating the two contiguous surfaces to a welding heat while free from atmospheric contact; second, supporting the casting in a die to prevent distortion; and third, uniting the two members by application of pressure while they are at a welding temperature and free from contact of atmospheric air.

614,875 Trolley for electric cars; Hosea W. Libbey, Boston, Mass.

614,882 Junction-box; T. J. Murphy, New York, N. Y.

614,914 Mechanism for controlling electric circuits; G. H. Whittingham, Baltimore, Md.—Consists of a movable device which immediately controls or affects the circuit, a screw which imparts motion to said device, a pulley-wheel carrying a lever which is adapted to engage the threads of said screw and thereby move it endwise in one direction, and means to place the lever in engagement with the screw.

614,927 Process of and apparatus for separating metals and by-products from ores by electricity; Geo. D. Burton, Boston, Mass.

614,928 Process of tempering metal; Geo. D. Burton, Boston, Mass.

614,930 Process of and apparatus for separating metals from ores by electricity; Geo. D. Burton, Boston, Mass.

614,941 Trolley device; Jas. C. Fernald, Philadelphia, Pa.

614,946 Telephonic microphone; W. D. Gharky, Philadelphia, Pa.

614,964 Dynamo-electric machinery; J. S. Lewis, Manchester, England—Consists of the armature spindle of a series of commutator segments, insulating material interposed between adjacent segments, rings under centripetal pressure surrounding the assembled segments and insulation at each end thereof, collars keyed to the spindle, annular grooves in said collars engaging with the rings and means for forcing said collars nearer together, so as to grip the rings.

614,982 Automatic time electric circuit switch; F. Richard, Boston, Mass.

614,995 Underground conduit for electrical conductors; Charles H. Sewall, Chicago, Ill.

615,057 Electro-mechanical striking mechanism; C. E. Beach, Binghamton, N. Y.

615,136 Electric metal-heating process; G. D. Burton, Boston, Mass.—The art of heating metal bars, which consists in subjecting the parts to be heated, while in contact with each other, to the action of an electric arc sprung between them and an electrolytic bath.

615,142 Signaling; John P. Coleman, Edgewood Park, Pa.

615,172 Primary battery; H. K. Hess, Philadelphia, Pa.—Consists of a series of partitions formed of frames of conducting material acting as one terminal of the battery and supporting sheets of porous material, said partitions forming chambers, the alternate chambers being for the reception of the depolarizing agent, the other chambers being for the reception of the exciting fluid and zinc electrodes.

615,176 Electric railway; Hermann T. Hillischer, Vienna, Austria-Hungary.

615,186 Electric safety device; John F. Kelly, Pittsfield, Mass.

615,209 Electrical hinge contact; C. Baxter, New York, N. Y.—Consists of a body and a swinging cover of a cabinet or box and the hinges thereof, a flat contact plate located upon the box and a contact plate located upon the cover of the box and having a spring-roll whose axis is substantially in alignment with the hinge pintles, said roll being in constant engagement with the flat plate.

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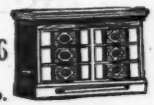
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Kindred.... ...Interests

A telephone inspector's set, comprising the small hand tools needed by inspectors of telephones, is being offered by the American Electric Telephone Company, of Chicago.

The Central Electric Company, Chicago, announce that they will have a great variety of all kinds of portable reading and desk lights. The peculiar adaptation of these types of lamps to so many different purposes has led to a wide variety of types that are adapted to most all conditions. These and many other useful articles will be fully illustrated in their new catalogue, which is about ready for distribution.

The Victor Telephone Manufacturing Company, of Chicago, have placed during the past month a 200-capacity exchange in Mitchell. S. D., including telephones and all appliances; another of 100 capacity in Bunceton, Mo.; also one of 200 capacity in Paxton, Ill., and another of 150 capacity, with 'phones, etc., in Rantoul, Ill. This company now have orders in their factory, working over time, for over 1,200 drops.

The Ironclad Resistance Company has acquired the plant and patents of the Ironclad Rheostat Company, of Westfield, N. J. The officers of the new company are R. H. Mansfield, Jr., president; A. W. Berresford, vice president; A. P. Munning, secretary and treasurer. These gentlemen have all been identified with the manufacture of rheostats for a number of years The company wish it announced that they are an independent company, having absolutely no connection with any other firm.

The Electric Appliance Company's new catalogue of telephone apparatus and telephone construction material, No. 14, is being very well received by the telephone trade, and, judging from the orders for telephone material that are being received by this well known Chicago house, is being very extensively used. The Electric Appliance Company claim that they have the most complete catalogue of telephone supplies that has yet been issued, and are pleased to supply copies free of charge to the telephone trade.

The Berlin Iron Bridge Company, of East Berlin, Ct., are erecting for the Waterbury Manufacturing Company, Waterbury Ct., a new blacksmith shop, two stories high. The building is to be of fireproof construction throughout. The floor consists of concrete on corrugated iron arches, carried by steel beams and columns. The roof has steel trusses supporting the covering of corrugated iron, lined with the Berlin Iron Bridge Company's patent anti condensation lining. The building is about 40 feet square.

When Mr. Thomas A. Edison, Jr., perfected the incandescent lamp now known to the electric light interests as the "Edison. Jr," lamp, he demonstrated well the fact that he is the son of his father. The feature of the lamp is in the filament, which gives unusual longevity and durability. Almost within a year the lamp has become a commercial success and this, in itself, means much in view of the high standard to which incandescent lighting had already been carried. Mr. C. A. Stillwell, the general manager for Mr. Edison, whose offices are at 29 William street, Lord's Court Building, New York, speaks most enthusiastically of results achieved by the lamp, and it is reasonable to believe a still greater future exists for it.

"I've seen many power plants perfect in every respect, until it comes to the transmission by belts," said a manager of an electric light plant, "and if these same people, who run these plants, knew how to treat their belts, this loss might be overcome. I'm using Cling Surface, and you may see for yourself how they run." The belts throughout the building in question were operated with such a sag that the top nearly lay on the path of the lower portion of the belt. "This Cling-Surface, which I am using," he went on to say, "is a patent preparation, which is put on the belt with a brush in small quantities. It softens and renders pliable the leather, leaving it in a peculiarly clinging condition, so that it passes from the wheel with hardly any loss of energy." Circulars and information of value to belt users will be sent on application to the Cling-Surface Manufacturing Company, 178-184 Virginia street, Buffalo, N. Y.

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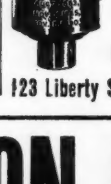

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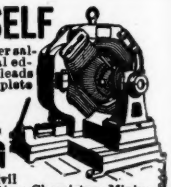

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